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Over the past decade, the business sector has come under increasing pressure to improve their environmental, safety, and health (ESH) performance. This pressure has stemmed from both external and internal sources with the organization. Public image, legislative and regulatory requirements, stakeholder awareness of environmental performance, sustainable development, and changing corporate values are driving forces that are leading companies to take a serious look at their ESH function.

The increased focus on the business and sustainable aspects of ESH issues has created a demand by management to assess the current organizational strategy related to ESH. Strategy, in this respect, can be thought of as the manner in which issues are approached and handled. Unfortunately, a comprehensive approach does not exist for assessing the ESH and sustainable development strategies of an organization and linking it to the overall competitive strategy of the organization. Developing a

framework for assessing the ESH strategies in an organization was the focus of this study.

The major portion of the research was the development of profiles for each of the four strategy developmental levels under the elements of an ESH management system. Six elements were identified from the literature that comprise an ESH function's strategy: 1) Strategic plan, 2) structure, 3) finance, 4) technical, 5) evaluation, and 6) information management. Within each of these elements, profiles were created for each of the strategy developmental levels that these elements may utilize: Resistive, adaptive, proactive, and sustainable. The study went beyond previous research by including safety and health aspects into the environmental strategy typologies, looking at ESH elements other than the strategic plan and structure, and providing a more detailed and comprehensive explanation of the strategy levels.

These profiles were peer reviewed then transformed into a series of questions that qualitatively assess the ESH strategies used within an organization. A pilot study was completed of a large high-tech manufacturing organization in Portland, OR. The pilot study demonstrated the usefulness of the tool to identify areas of improvement in an ESH function. Use of this assessment tool is the first step an organization needs to take to understand where they exist in the scale of ESH strategies, and if this is the ideal strategy to follow.

A Framework for Assessing the Environmental, Safety, and Health Strategy in an Organization

By

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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Brian C. O'Malley, Author

CONTRIBUTION OF AUTHORS

Dr. Anthony Veltri started this research project in the mid-90's and was still in the initial stages when I approached him for a thesis topic in 2000. His groundwork and guidance helped bring about the final product.

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1. INTRODUCTION

1.1 Introduction to the Problem

Over the past decade, the business sector has come under increasing pressure to improve their environmental, safety, and health (ESH) performance. This pressure has stemmed from both external and internal sources with the organization. Public image, legislative and regulatory requirements, stakeholder awareness of environmental performance, and changing corporate values are driving forces that are leading companies to take a serious look at their ESH function. Previous research has pointed out the growing interaction and complexity between ESH and business issues (Porter, 1995; Singh, 2000). ESH concerns can either enhance the business processes of the organization, or it can hinder progress and act as a barrier to future competitiveness. Given the increasing awareness of ESH issues and governmental regulations, this area cannot simply be ignored.

With the concept of sustainability and sustainable resource development taking hold in the way public policies are being made, the methodology behind this concept is also taking root in private businesses (Hart, 1997). Increasingly, businesses are adopting strategies that advance the societal goal of sustainable development by reducing the ESH impact of industrial products, technologies, and manufacturing processes. The economic benefits from improved ESH performance (i.e., reputation

enhancement, regulatory compliance, employee relations, resource protection, environmental impact, etc.) and business performance are objectives of a sustainable organization and will add to the competitive advantage of the organization. This manner of thinking goes beyond traditional regulatory compliance by viewing resource (human, facilities, equipment, materials, energy, etc.) loses or injuries as a form of economic waste. Emissions, wastes, and incidents/accidents are a sign that resources have been used incompletely, inefficiently, or ineffectively. The concept of sustainability opens up a new way of looking at both the full system costs and the value associated with the organization's products, technologies, or services.

The increased focus on the business and sustainable aspects of ESH issues has created a demand by senior-level executives to assess the current organizational strategy related to ESH. Strategy, in this respect, can be thought of as the manner in which issues are approached and handled. Traditionally, ESH strategies have concentrated on maintaining regulatory compliance. But with the recent integration of this function throughout all facets of organizations and the advent of sustainable resource development, new strategies have emerged beyond compliance. Unfortunately, methods for assessing the current strategy of this function within organizations have not been developed. Organizations are not able to effectively manage this function because they are unable to evaluate how the existing ESH strategy matches with the organizational strategy of enhancing competitive performance. Many organizations are not even aware of alternate strategies available in dealing with ESH challenges and what it would take to change to them. Menon and Menon (1997) proposed a theoretical framework for future research in the

environmental field that identified the need to 'develop a valid scale for environmental strategies and tactics'. This is an area that organizations would derive immense benefit from more research and is one of the principle concerns of this study.

1.2 Problem Statement

An approach does not exist for assessing the ESH and sustainable development strategies of an organization and linking it to the overall competitive strategy of the organization.

1.3 Purpose and Objectives of the Research

The purpose of this research is to examine and identify the different ESH strategies existing and pursued by organizations. Underwriting this purpose are three objectives in completing this project: 1) Development of the initial template of elements and developmental levels of an organization's ESH strategy, 2) formation of a scoring tool to accompany this template that performs qualitative ranking on the organizational elements according to the developmental levels identified, and 3) subjecting this assessment tool to a peer evaluation and a pilot test.

Completion of these objectives should answer the following research questions:

1) What are the ESH strategies that are available to an organization?
2) How do peers (from private organizations, public organizations, and academia) view the strategies presented in the Veltri/O'Malley matrix?

3) What is the actual tool/method that should be used to assess the current ESH strategies being pursued by an organization?
4) What does the pilot study tell us about the applicability and usefulness of this assessment tool?

1.4 Limitations

The ESH strategic profiles were developed with a bias for larger organizations. For this study, larger organizations are defined as those with 400+ employees, encompass activities that utilize human/natural resources, and fall under regulatory jurisdiction for environmental, safety, and health issues.

1.5 Definitions/Abbreviations

Sustainable Resource Development – The establishment of a decision-making process that integrates the efficient conversion of resources with concern for long -term environmental/safety consequences.

Organizational Competitiveness – The ability to create enduring value with the products or services of one organization over that of its competitors in the minds of customers (Dechant and Altman, 1994). The organization must anticipate what the rapidly changing environment (social, regulatory, technical, etc.) will be like, and adjust their processes/activities and other relevant factors so as to reap the benefits of changing times.

Organizational Sustainability - Continually ensuring organization existence through forward looking activities and embracing ideas that generate value to the organization. These might include:

- Preserving the right to operate by meeting societal demands.
- Reducing cost and liability by making processes cleaner, more efficient and community-friendly.
- Enhancing customer loyalty and market position by taking stewardship for the product though its lifecycle.
- Accelerating revenue growth in new markets for environmentally and socially preferable businesses, products and services.

Each of these drivers adds to the financial strength of a company by reducing operating risk, lowering costs, or increasing revenue thus potential sustaining the company in the long run (Day, 98).

ESH – Environmental, Safety, and Health.

2. LITERATURE REVIEW

An organization can be characterized as a system of strategic developments that is shaped by the successful development and deployment of a range of resources and organizational activities (Richardson and Thompson, 1995). The success of this development is dependent on the competence and accuracy of the organization's components in following a desired strategy. An organization's strategy outlines how management sees the organization achieving its overall objectives and goals. Therefore it would make sense for an organization to periodically evaluate its strategy to ensure congruence with its mission and long-term objectives. From this point of view, strategy evaluation can also act as a 'wake-up call' to adjust/improve their strategic level to an alternate, available option that creates a better fit.

Eden and Ackermann (1993) evaluated organizational strategy by looking at three elements of the process: 1) An evaluation of the extent to which strategy is embedded in the organization and has been attained, 2) an evaluation of the assumptions underlying the strategy, and 3) an evaluation of the extent to which strategy has influenced the thinking of those at different levels of the organization. The authors extrapolated that the proper evaluation of organizational performance and strategic development is dependent upon establishing 'indicators' that are directly related to particular strategic levels. Thus, identifying particular activities and structures will be indicative of the strategy being utilized by the organization and act as a framework for basing changes/improvements in the strategy being followed. Within this concept, evaluation should not only look at the overall organizational

strategy, but instead take a multi-competence view of different areas (Richardson and Thompson, 1995). With the highly distinct departments within modern day organizations, each could be evaluated separately to: 1) Assess the strategic level being utilized and, 2) to view how the strategic level of this department matches other units and the overall organizational business strategy.

Two of the best-known models of strategy typologies were developed by Miles and Snow (1978) and Porter (1980). Miles and Snow (1978) identified four strategic typologies: Defender, prospector, analyzer, and reactor. These strategy types each represent a recognized collection of activities and structures within the function that determines its' strategic behavior. Miles and Snow theorized that the strategy that a particular function follows is a unique combination of structure and management processes that are consistent with that strategy. Therefore, it makes sense that identifying the combination of structure and management processes will identify the consistent strategy that fits this combination.

Similarly, Porter (1980) proposed that organizations operate within one of three generic strategies at the business level. These three generic ty pes are: Cost leadership, differentiation, and focus. Business pursuing the different strategies described by Porter will differ in their internal processes, goals, and behaviors (Kumar and Subramanian, 1997/1998). As with the Miles and Snow (1978) strategy evaluation model, Porter's typologies intend that a strong alignment between strategy and internal processes must exist if organizational performance is not to suffer (Miller and Friesen, 1986).

Business areas that have received specific attention in regards to strategy evaluation are the marketing function and manufacturing function. In the marketing evaluation study by Stathakopoulos (1998), the authors used the strategic levels and methodology identified by Miles and Snow but re-labeled the titles as type 1, type 2, type 3, and type 4 respectively. This controlled for responses that would have been influenced by the initial titles of the strategies. This typing of organization functions into archetypal groups is particularly appropriate because different levels, such as defenders and prospectors, entail different internal structures and administrative processes as found by the Miles and Snow study (Snow and Hrebiniak, 1980).

Within the manufacturing field, Ward and Bickford (1996) developed four generic strategic patterns that are available to organizations in their path to competitive advantage. The four basic patterns are designated as: Niche differentiator, broad differentiator, cost leader, and lean competitor. Similar to the importance of the internal processes in the models proposed by Porter and Miles and Snow, the study aligned its strategic types within a combination of competitive strategy, organizational structure, the environment, and a framework of manufacturing capabilities and decisions (Ward and Bickford, 1996).

With the growing importance that ESH issues are having on the business cycle, senior management is viewing this function on the same level as other established functions, such as the marketing and manufacturing function. The issue has been thrust onto senior management as the threat of significant legal and financial liability, the growing pressure of regulations, increasing costs, intense public scrutiny, and competitive issues must now be considered as integral to organizational objectives,

performance, and success (Greeno and Robinson, 1992; Gallarotti, 1995). Historically, there have been a number of impediments that have formed a barrier between linking business aspects and organizational strategy to the ESH function. These included:

- Organizational difficulties in aligning ESH and company business perspectives.
- Inability to show ESH as the business issue that it is. This is related in part to difficulties in communicating ESH issues in a business context.
- Cost and resource issues, including the common problem of ESH being delegated as a cost function without profit or value potential.
- Environmental issues are not managed as part of the business management and decision-making responsibility. (Arthur D. Little, Inc., 1996)

But many organizations have recognized these shortfalls and implemented managerial incentive structures that permeate throughout the organization. Along with this continuing implementation, senior management has created a demand for a tool that assesses the current ESH strategy in a similar way that other business functions, or the overall organizational strategy, are evaluated.

Over the past decade, a number of researchers have developed categories of environmental strategy that describe the manner in which organizations deal with environmental issues. The categories portray the logical progression an organization may evolve through as environmental issues take on greater importance within operational decisions. One of the first environmental strategy definitions was developed by N. Roome (1992). Within this work, three strategy types were identified: Non-compliance, compliance, and compliance-plus. Essentially, these strategies

centered on the organization's awareness of regulatory imperatives. This ideology was followed in subsequent studies conducted by J. Schot and K. Fischer (1993), R. Welford (1994), and S. Hall and N. Roome (1996) that progressively implemented the concepts of environmental liability, cost, and organizational competitive advantage into the environmental strategy categories. Although differences exist between the strategy levels identified in each study, the classifications are based on distinguishing strategic postures along a continuum from reactive actions to the most proactive examples. A listing of these strategies and their primary definition was developed by Tilley (1999) and is given as Table 2.1.

Recently, these strategies have been compiled into four key environmental strategies that encompass the core principles outlined in preceding work (Tilley, 1999; Slowinski and Chatterji, 1997; Adler et al., 1992). This compilation was a necessary step in outlining the available environmental strategies, as up to this point there were no universally agreeable levels in which to place organizational actions (Elkington et al., 1992; Fischer and Schot, 1993; Dauncey, 1994; Roberts, 1995; Lober, 1996). These 'key' strategy levels that an organization can utilize are labeled as resistive, adaptive, proactive, and sustainable. A brief generalized description of these levels is given below. The concept of sustainability will be more comprehensively defined later in the review as it is subject to differing interpretations.

- *Resistive*: An environmental policy does not exist because the organization does not believe this area has any potential advantage within their business activities.

Table 2.1 – Developmental Levels of Environmental Strategies for Business
(Adapted from Tilley, 1999)

Roome, 1992

1. *Non-compliance*: Little concept of the significance of environmental imperatives.
2. *Compliance*: Reactive approach driven by legislative agenda.
3. *Compliance-plus*: Companies that take a proactive position.

Schot and Fischer, 1993 [Strategies are derived from two separate studies: the first by Petulla and the second by Kirchgeorg]

1. *Crisis-oriented*: Passive and dependent response to the environment.
2. *Cost-oriented*: Defensive approach; regulation accepted as a cost of doing business.
3. *Enlightened*: A reactive rather than anticipatory approach, with a preoccupation with the regulatory agenda.
4. *Innovative*: (environmentally oriented) Beyond compliance; based on an expectation of seeking excellence in protecting the environment and creating new opportunities on the road to competitive advantage.

Welford, 1994

1. *Ostrich*: No response; does not recognize the environmental challenge facing business.
2. *Laggard*: No response; recognition but more pressing demands on the business agenda.
3. *Thinkers*: Still not responding, but taking a positive watching brief on developments.
4. *Doers*: A proactive strategy, implementing changes, planning ahead and communicating actions.

Hall and Roome, 1996

1. *Compliance*: Legal-compliance approach driven by a need to minimize any liabilities.
2. *Eco-efficiency*: Operational emphasis on reducing costs and creating a more economically efficient business.
3. *Environmental*: Ecological approach, by integrating ecological values to build competitive advantage and transform business.

- *Adaptive*: Environmental issues are approached as they arise and are predominately viewed through a regulatory compliance standpoint.

- *Proactive*: The organization has recognized the economic and social benefits of tackling environmental issues proactively instead retrospectively. The organization demonstrates a deliberately managed effort in improving their environmental performance.
- *Sustainable*: The organization has permanently established a decision-making process that integrates the efficient conversion of resources with concern for long-term environmental consequences (Epstein, 1996 pp. 23-24).

Within the strategy categories defined by the researchers, the focus was on the overall strategic plan in how to approach and respond to environmental issues. This follows the existing trend in research that approaches 'environmental strategy' from a broad organizational view (Dechant and Altman, 1994; Sharma and Vredenburg, 1998; Berry and Rondinelli, 1998; Newman and Breeden, 1992). The organizational view includes the mission statement and structure of the company but leaves out the manner in directly propagating this strategic plan on more practical functional levels. An organization is comprised of numerous functions (e.g., marketing, finance, Research and Development, etc.) that operate in conjunction for the benefit of the whole. Each of these functions in itself can be broken down into components that are necessary for the function to carry out its' strategic operatives. For example, the engineering function might be comprised of a research and development, design, and technology transfer components. The same holds true for the environmental function within an organization. It is composed of structures, activities, and components that help the function operate. This assemblage of environmentally related functions is often referred to as the Environmental Management System (EMS) of the

organization. These include the organizational structure, planning activities, responsibilities, processes, and resources for developing, achieving, reviewing, and maintaining the organization's environmental policy (Hill, 2000). For an assessment of the strategies present within the EMS to be completed, as can currently be done with organizational strategic planning, the specific elements that compose an EMS must be identified.

When looking at the possible elements of an EMS, this study has focused taking a resource-based view of the organization. Hart (1995) argues that corporate responses from increased demands for environmental protection is an important, emerging, and competitive domain for businesses and is best understood in terms of the resource-based view of the organization. He predicted that innovative environmental strategies within this context could lead to the development of organizational-specific capabilities, which can become sources of competitive advantage. In the resource-based view, resources are classified as tangible, intangible, and personnel-based (Grant, 1991). Tangible resources include physical resources such as the plant, equipment, raw materials, and financial reserves. I ntangible resources include technology and human resources (training, expertise, commitment, and loyalty of employees) (Russo and Fouts, 1997). Therefore a resource-based view has a deeply rooted interest in establishing a company-wide strategy and structure that: 1) Prepares, protects, and preserves organizational resources, 2) enhances compliance with regulatory requirements, and 3) uses resources in ways that create added value (Russo and Fouts, 1997; Rugman and Verbeke, 1998). Within this context, the safety and health functions are naturally integrated with the environmental function, as both

essentially protect the organization and its resources from risks, losses, and dangers. To date, these two functions have been left out of all published strategic assessments tools. Only the technical function assessment tool by Adler et al. (1992) contains a regulatory element that is related to safety and health compliance. The work done by Adler et al. is discussed later in this chapter.

In breaking down the elements of an EMS, a review of the current practices within companies has shown the repetitive presence of a 'strategic plan' and outlines for 'structuring' the function (Coglianese and Nash, 2001; Epstein, 1996; Piasecki et al., 1999). Other elements are not as clearly defined but can be identified through the operational needs of a successful ESH function within a company. ISO 14001, a voluntary standard for improving environmental programs, has outlined a need for system auditing, performance evaluation, emergency response, documentation, and policy development (Harrington and Knight, 1999; Tibor and Feldman, 1997). Using this as a basis, this study dove deeper and selected those organizational elements that bring about the actions proposed under ISO14001 and other EMS guidelines. In looking through the literature on ways for organizations to alter their EMS programs, a pattern could be seen in grouping the research under four topics that organizational management needs to consider. These four are in addition to the already well-reviewed literature dealing with the strategic plan of the function and structuring it within the organization. The additional four included: The management of ESH information (Rikhardsson, 1998), technical capabilities in dealing with ESH issues (Sharfman et. al., 2000; Chatterji, 1995; Adler et al., 1992), financing ESH projects, and evaluating ESH performance (Burritt, 1997; Young and Welford, 1998). Within these four, only

'ESH technical capabilities' has had assessment tools developed to evaluate one component of this element, research and development.

The technical assessment tools by Chatterji (1995) and Brockhoff et al. (1999) listed the variations in the strategies that research and development applies when addressing environmental considerations. These strategies detail the progression of a research and development laboratory from compliance management to strategic leadership. The tool by Chatterji (1995), unlike the earlier mentioned assessment tools dealing with strategic plans, uses a five step progression: Reactive, participative, active, innovative, and leadership. This assessment tool was designed for use in research and development (R&D) organizations and not in large firms where R&D is a secondary or tertiary focus. But the dual strategic attention that this tool gives on incorporating company-wide plans of action and simultaneously addressing environmental concerns and opportunities was worth noting as a form of proactive and possibly sustainable action. A listing of the primary strategies derived from both these tools is given in Table 2.2.

A similar assessment tool with an R&D aspect was developed by Adler et al. (1992). This early work characterized four developmental stages for a variety of technical functions within an organization. These technical functions included R&D, management information systems, and manufacturing engineering. Adler et al. (1992) recognized that the technical functions within organizations were comprised of many elements that reflect on the strategy being utilized within that area. The authors indicated that the tool's framework could be adapted to fit other functions with an organization. As this thesis project expanded into different functions of the

organization, the structure of the proposed assessment tool owes a lot to the framework presented by Adler et al. (1992). The developmental stages (strategies) developed in Adler's et al. (1992) work on regulatory compliance within technical functions are presented as part of Table 2.2.

Table 2.2 – Environmental Strategies for Business From the R&D Perspective

Chatterji (1995)

1. *Reactive*: R&D organizations operating on this first level simply develop and implement basic management systems and processes to digest and address the multitude of federal and state environmental regulations specific to R&D facilities. Environmental management is treated as an administrative burden and delegated to a safety and environment manager.

2. *Participative*: At the next stage of evolution, the R&D management and staff are aware of the need to collectively manage the environmental well-being of the facility.

3. *Active*: R&D organizations at this third stage have moved on to establishing an environmental analysis and planning framework for their R&D projects. The management and staff routinely examine the environmental dimensions of all proposed R&D projects before they are undertaken, and regularly review the results from ongoing projects against original assumptions.

4. *Innovative*: At this advanced stage of progression, the R&D organization is actively seeking out innovation opportunities in environmentally-friendly products, processes and services. Unlike the organizations in the "active" stage, those in the "innovative" stage place high priority on generating promising, environmentally-driven R&D project ideas.

5. *Leadership*: This represents the highest level of organizational planning and commitment for the R&D function and indicates a strong strategic alignment between the R&D director and the company's executive management team. The R&D director (or the chief technical officer) has helped shape a corporate strategy aimed at encouraging and sustaining an environment-based search for technical and non-technical innovation

Brockhoff, Chakrabarti, and Kirchgeorg (1999)

1. *Defenders*: Place high importance on responding to regulations as well as to anticipating new regulations and standards.

2. *Escapist*: See little importance in anticipating regulatory standards. Rather aim to quit their current level of business and exploit new markets.

3. *Dormant*: Often do not follow established environmental policies if they exist within the company. Companies in this category feel that they are at low environmental risk and see limited potential in environmental goods.

(continued on next page)

Table 2.2 – Continued

4. *Activist*: Responsive to current and anticipated regulations and place high importance on exploiting new markets. These companies see market opportunities as more relevant to their competitive position.

Adler, McDonald, and MacDonald (1992)

1. *Isolated*: Compliance is viewed as a hindrance to getting work done. Managers and employees "get away with" what they can.
2. *Reactive*: A formal regulatory compliance policy exists and periodic assessments take place. However management does not take an active role to ensure that both the spirit and letter of the policies are followed.
3. *Proactive*: Internal publicity is used to promote regulatory compliance. Employees are trained to recognize and handle environmental issues. Management maintains open relationships with community leaders and regulators.
4. *Integrated*: The organization proactively deals with personal, environmental, health, and safety regulations. Long-term goals and intermediate milestones are established while progress is constantly monitored. Products and processes are designed to minimize environmental impact.

One of the accepted ESH strategic levels, 'sustainable', has been the subject of controversy among those with varying definitions and applications of the term. Sustainability has been a recent development that has gone beyond the resistive, adaptive, and proactive strategies that typically operate within the dominant organizational culture (Tilley, 1999). Simply put, sustainable strategies focus on using environmental responsibility as the path to cost reductions, market differentiation, sustained compliance, and continued existence (Stead and Stead, 2000). Tactics and activities congruent to this strategy aim to: 1) Reduce cost and liability by making processes cleaner, more efficient, and community-friendly, 2) enhance customer loyalty and market position by taking stewardship for the product though its lifecycle, and 3) accelerate revenue growth in new markets for environmentally and socially

preferable businesses, products, and services. Each of these drivers can add to the financial strength of a company by reducing operating risk, lowering costs, or increasing revenue thus potentially sustaining the company in the long run (Day, 98). This long-term holistic integration of pollution prevention principles, product stewardship, and environmental responsibility are what distinguishes sustainability from other strategies.

Based upon the existing literature, this proposed thesis project aimed to go above and beyond previous research in the following ways. First, the strategy typologies presented in Tables 2.2 and 2.2 focused on environmental issues. As this author is taking a resource-based view of the organization, safety and health aspects are included in the strategy profiles. Secondly, the strategy profiles go beyond the conventional look at only the strategic plan and structure of implementing ESH strategy by including four additional elements of an Environmental Management System. Thirdly, previous strategy profiles are incomplete in describing all the characteristics and components involved in strategic actions. This study provides a comprehensive and detailed description of the personnel, structures, and activities that characterize each particular strategy.

3. METHODOLOGY

3.1 Tool Development

The major portion of this study was the development of profiles for each of the four strategy developmental levels under the elements of an ESH management system. Six elements were identified from the literature that comprises an ESH function's strategy: 1) Strategic plan, 2) organizational structure, 3) finance, 4) technical, 5) evaluation, and 6) information management. An all-purpose definition of the elemental strategies can be found in Table 3.1. Within each of these elements, profiles

Table 3.1 – Elements of an Organization's Env., Safety, and Health Strategy

1. *Strategic Plan*: The manner in which the organization intends on confronting and managing ESH and sustainable resource development issues.
2. *Organizational Structure*: The approach used for arranging and implementing ESH and sustainable resource development strategy within the organizational structure of the firm.
3. *Financing*: The manner in which the organization intends on funding ESH and sustainable resource development strategy.
4. *Technical*: The manner in which the organization intends on creating and transferring technical knowledge used to confront and manage ESH and sustainable resource development issues.
5. *Evaluation*: The manner in which the organization intends to evaluate ESH performance and sustainable resource development practices.
6. *Information Management*: The manner in which the organization provides information to internal and external parties (customers, stakeholders) on ESH strategy control, progress, and sustainable resource development.

were created for each of the strategy developmental levels: Resistive, adaptive, proactive, and sustainable. A general characterization of each of these developmental levels of ESH strategy can be found in Table 3.2. The profiles for the strategic plan, structure, and financing elements were developed through a research project by the author's major professor, Dr. Anthony Veltri. The remaining profiles were developed through an extensive literature review of the existing methods being utilized by large organizations in the U.S. and Europe in tackling ESH issues. From the ESH activities and objectives present within these organizations, the strategic manner in which they addressed issues was extrapolated.

Table 3.2 – Developmental Levels of Environmental, Safety, and Health Strategy

Level 1. (Resistive)	Minimal and reluctant effort extended with a tendency to respond to ESH issues only after the fact.
Level 2. (Adaptive)	Reactive, narrow, and predominately technical effort extended with a tendency to be focused on the mechanics of complying with ESH regulations.
Level 3. (Proactive)	Broad technical and strategic management effort extended with a tendency toward accepting and internalizing ESH issues.
Level 4. (Sustainable)	Extensive and forward looking strategic management, finance, and technical effort extended with a tendency to be focused on the competitive value of ESH practices.

To insure that the same specific issues were addressed within each element through the developmental level progression, three components were identified that essentially comprised each particular element. The components provided direction and a framework for describing the strategic intent present. The components for each of

the strategy elements are given in Table 3.3. Each of the components is addressed within each profile.

The aim was to fit the strategy profiles into a matrix that could be looked at both horizontally and vertically (Table 3.4). Each of the six strategy profiles for a particular level, e.g., resistive, should follow the same logic and theory. Therefore, the

Table 3.3 – Core Components of the ESH Strategy Elements

Elements	*Components*		
Strategic plan	Organizational response	Strategy Formulation Process	Strategic Intent
Structure	Arrangement	Direction	Functional Positioning
Financing	Financial Arrangement	Access to Financial Resources	Financial Tools
Technical	Technical Tools	Planning Processes and R&D	Training
Evaluation	Process	Performance Tracking	Assessment and Evaluation
Info. Mgmt.	Information Compilation	Access	External Reporting

strategies will match as you review the information vertically through the six elements. Additionally, the progression of the strategy profiles horizontally, from resistive to sustainable, should be coherent for each of the elements. Often the literature only presented the extremes in discussing the manner in which the organizations tackled ESH issues. This is common in the environmental literature as only the worst-case and best-case scenarios are of interest in comparing the developments within the field. The acceptance of the four strategy levels is also a recent advancement in the field that to this point has only concentrated on the overall strategy of the organization. Therefore, this is the first attempt at defining the available strategies within specific elements of the ESH function. As such, examples of the

tactics used by organizations that represented the middle scale strategies (i.e., adaptive and proactive) were difficult to identify within the literature. By cross-referencing the horizontal and vertical flow of the profiles within the matrix, and matching these against some of the harder to place existing tactics in the literature, all the profiles within the matrix were completed.

Table 3.4 – Framework of the Strategy Profile Matrix

		Developmental Levels			
		Resistive	Adaptive	Proactive	Sustainable
Elements	Strategic Plan				
	Structure				
	Financing				
	Technical				
	Evaluation				
	Info. Mgmt.				

3.2 Peer Review

With the completion of the strategy profile matrix, a peer review of the matrix was undertaken. Six individuals within the ESH field were chosen based on their experience within the elements defined by the strategy matrix. The peer reviewers were also selected with the aim of having academia, government, and the private sector represented. A listing of the titles and occupational roles of the peer reviewers can be found in Appendix K.

Each of the peer reviewers was assigned two different elements that fell within their experience and knowledge in the ESH field. Therefore, two individuals from two

diverse areas (e.g., academia, etc.) reviewed each element. The reviewers were given the elements with instructions to judge whether or not they agree with the profile content. Specifically, each was asked to make comments on:

- Do you agree that this element should be included in an ESH strategy assessment tool? Why or why not?
- Do you agree that the strategy profiles match their designated developmental levels (e.g., resistive, etc.)? Why or why not?
- What changes or additions would you make so that the profile accurately reflects the strategy for this level?

Once all the reviews were returned, the suggested changes were implemented with attention so that the matrix still was congruent when followed horizontally and vertically. If significant suggestions or changes were noted, these were subsequently implemented and returned for a final confirmation. This process of identifying a group of peers with exceptional knowledge in this field, and the repeated submission of the assessment tool for additional clarifications, strengths, weaknesses, and new ideas, is based upon the Delphi Technique (Clayton, 1997; Mitchell, 1991).

The choice of using six reviewers was based upon the integrative aspects of the strategy matrix. As information is altered in one of the cells, subsequent cells may be affected if the major strategy components are altered. Successive cells will have to be evaluated if any part of the matrix is revised. Additionally, as this tool is a pioneer in the ESH strategy assessment field, it is open to very liberal and possibly conflicting interpretation if reviewed by an excess of individuals. Implementation of suggestions from a defined sample of experts within the ESH field is more feasible and effective

when establishing a consensus for the tool's content. Having six experts with the areas look at two elements apiece provided the necessary critique without having the tool being pushed back and forth between individual preferences.

3.3 Scoring Tool

With the strategy matrix finalized, a qualitative scoring tool was developed to assess the strategy currently being utilized within an organization. The tool will not give an overall score of the organization but rather will assess each individual element. Initially, the aim was to create a composite score of the six elemental scores. This was abandoned as it became apparent that combining scores from unrelated sections is not practical. The same justification can be found in the public health field with the short-form 36 (SF-36) developed for the Medical Outcomes survey. The SF-36 measures eight different health concepts that are used to measure an individual's overall health status (Larson, 1997). The survey's standardized scoring system yields a profile of eight health scores that are viewed separately. Combination of the scores into a comprehensive figure is impractical since measures of differing indexes are not additive. Likewise, the six elements of an ESH strategy measure separate areas that should not be combined into a meaningless score.

In determining the strategic level of the elements, a variety of statistical techniques were looked at to see if they were viable with this study. Likert, Guttman scaling, and the Myers-Briggs Type Indicator® were investigated to determine their compatibility with the content and objectives of this study.

The Likert scale is inappropriate for this study, as a total numerical value cannot be calculated for the responses. This is due to how only a subsection of the questions will be asked to an organization instead of all the questions from each of the four developmental levels.

Guttman Scaling is unsuitable because a respondent who agrees with any specific question on the developmental list will not also agree with all previous questions. Although the developmental levels are progressive in nature, the questions within them are not cumulative or on an incremental scale.

The Myers-Briggs Type Indicator® uses a series of questions for measuring a person's preferences by applying four basic scales with opposite poles. Using this for a basis, the idea of designing a number of potential scenarios an organization might encounter, with regards to ESH issues, was explored. The scenarios would require the participant to answer how their organization would respond to the issue. The responses would reflect the four possible strategic responses identified in this study. Unfortunately, this method relies on developing specific scenarios, which might not have any relevance to the organization being assessed. The aim is to keep this assessment tool in a generalized form that can be applied within varying industry types. The use of definite scenarios can be employed when adapting the tool for a specific industry type.

The most accurate method is the use of a questionnaire that identically reflects the diction in the matrix (Table 3.4). In the beginning of an assessment for a particular element within the ESH function, the interviewer will ask a baseline multiple-choice question that will be founded on the information in Tables 3.1 and 3.2. The answer

given by the interviewee will determine the set of specific questions that will identify the developmental level. These specific sets of questions will be taken directly off the profiles in appendices A-D. They will be in the form of 'yes' or 'no' questions that will ask the organization whether or not they follow that strategy aspect. Each of the levels has a different number of questions as the levels contain varying amounts of information. Therefore, it is impossible to provide an exact number of 'yes' answers required to determine a strategy level. The goal is to have an affirmative answer from all, or a majority, of the questions in a strategy section. In the event that a minority of the questions under a section are not answered 'yes', the interviewer will look for similar questions in the surrounding strategy levels. Those aspects that exist outside of the majority strategy level will be identified in the results. If the majority of answers are 'no' to a level, then a whole new set of questions should be asked from the proceeding or preceding levels.

3.4 Pilot Study

A pilot test of a high-tech manufacturing organization within Portland, Oregon was conducted to demonstrate the application of the scoring tool. The company and its subsidiaries provide electronics manufacturers with equipment necessary to produce key components used in wireless communications, computers, automotive electronics, and many other electronic products. The company employs over 1000 people within its domestic facilities.

The pilot test looked at the corporate strategies present at the Portland, California, and Minnesota facilities. The assessment included a personal interview with the corporate ESH manager and an assistant. Due to time conflicts, additional specific information relevant to the assessment was obtained from Design Engineers and Human Resources personnel in meetings and phone conversations before the primary assessment on the 20th. The interviews took approximately 15 minutes for each element and consisted of the 'yes/no' questions from the possible strategy levels. Receipt of 'yes' answers indicated that the organization did follow that particular strategy. In the case of 'no' answers, the interviewer moved up or down a level until the majority of the answers were of the affirmative. Additional clarifications were asked in the cases of ambiguous or unrelated answers. The scoring tool was not designed with the intention of becoming a self-assessment. The interviewer was present for the assessment and did not provide the organization a copy of the questions beforehand. Conduction of the pilot test on the manufacturing organization and the satellite locations took place through the corporate Portland office. The company was provided a copy of the results and an interpretation of their meaning.

In addition to demonstrating the use of the tool, the author noted concerns in the use of the tool in an actual organizational setting. The lessons learned from the pilot study will be incorporated into the tool for future trials outside the focus of this study.

4. RESULTS AND DISCUSSION

4.1 Peer Review

The peer review introduced a few changes on the content and future use of the tool. The overriding majority of the suggestions were word substitutions and sentence structure alterations that were essentially suggested to clarify the content to the reader. A couple of the peer reviewers felt that the information in the levels was too complex for the typical worker in the ESH field to comprehend. But as this tool is designed for use by the same group of consultants with expertise in its use, they will be able to handle questions from the interviewees.

The intended end-user of the tool also brought up a question on the progressive nature of the four different levels. The wording of the lowest level (resistive) and the highest level (sustainable) clearly indicate unacceptable and highly desirable strategies within an organization. A peer reviewer felt that if this product was to be used for self-evaluation, that the scores would be biased toward the higher levels. For an organization to derive any benefit from the assessment, honesty is expected. As the organization is spending the time and cost to bring in a consultant, it would only be worth their effort to provide accurate information.

The nature of the reviewers' comments was biased toward their industry type and personal experiences within that field. This was mainly seen in the comments directed toward the sustainability level. Half of the reviewers were unaware of developments and strategies within organizations that could be classified as

sustainable. Conversely, others that reviewed these same elements had in fact been aware of these strategies and commented on the content. In no instance did both individuals for one element not have any knowledge or experience within this strategic level.

Overall, the reviewers did not find discrepancies between the levels when compared to the second element that each reviewer was given. The consensus was also that the elements are reflective of the subject area being evaluated and are appropriately progressive from one level to the next. All grammatical suggestions were incorporated, as were any specific additions. In no case did the comments or additions of a reviewer conflict with those of another. Due to the minor nature of the actual alterations to the original elements, a second round of review with the incorporated changes was not deemed necessary. Questions that concerned the use of the tool were clarified personally with each reviewer. The finalized profiles of the developmental levels for each of the elements are presented in Appendices A-D.

4.2 Pilot Study

The pilot study took place on August 20, 2001 on the premises of a high-tech manufacturing plant in Portland, OR. The assessment took one hour and thirty minutes to complete all six elements. This was longer than the one hour that was originally hypothesized. Unexpected additional time was required for clarification and discussion on the author's meaning of certain questions. This was foreshadowed from the two peer reviews that felt the questions were too complex. As the corporate office

in Portland essentially manages ESH activities at the satellite facilities, the strategies at the different locations are identical. Although a different level of environmental or safety issues exist within the 3 main facilities, the manner in which these issues are addressed is consistent. The corporate ESH coordinator in Portland revealed this consistency. Therefore, the assessment was undertaken on the organization as a whole, and not three separate assessments.

Each of the six elements, and their subsequent components, were evaluated separately and in the order provided in the methodology chapter. An initial question was asked that helped determine which set of developmental level of questions to begin asking. The assessment questions for all the elements can be found in Appendices E-J.

For each of the element assessments below, a table is provided that has an 'X' indicate where the interviewee answered 'yes' to the matching question. To match the receipt of a 'yes' answers with the questions, reference these tables with the questionnaires in Appendices E-J. Each box within the tables represents a possible question that was asked.

Table 4.1 – Strategic Plan Results

Components	*Developmental Levels*			
	Resistive	Adaptive	Proactive	Sustainable
Organizational Response		x x		
Strategy Formulation Process		x x x x		
Strategic Intent	x	x	x x x	

In response to the initial question, the interviewee felt that the manner in which the organization intends on confronting and managing ESH issues is through an adaptive strategy. For each of the three components under the strategic plan element, the questions started from this level.

Component 1 (Organizational Response) – The organization's ESH responses are dependent and driven by regulatory issues. These responses typically do not concern how they match with the competitive aspects of the organization. The organizational response to ESH issues firmly follows an adaptive strategy.

Component 2 (Strategy Formulation Process) – Senior level executives within the organization are detached from the ESH strategy formulation process. These executives see the ESH issues strictly from a legal standpoint and see the ability to stay in compliance as an achievement. When major business operating decisions are made, staying in compliance may become a minor consideration. The ESH Strategy Formulation Process firmly follows an adaptive strategy.

Component 3 (Strategic Intent) – The strategic intent of the organization is to adapt imaginatively and effectively to all ESH issues. This improves the management of risk and contingent liability facing the organization. This management is in the form of programs (e.g., workplace violence, electrical, hazard communication, etc.) that look at regulatory compliance issues and beyond. These programs are part of a strategic plan that has short and long term objectives. Although a proactive intent and ESH plan exist, a formal strategy, or mission statement, does not exist within the ESH function. This absence is an aspect of a resistive strategy.

Table 4.2 – Organizational Structure Results

Components	Developmental Levels: Resistive	Adaptive	Proactive	Sustainable
Arrangement		x	x x	
Direction		x x	x	
Functional Positioning		x x		

In response to the initial question, the interviewee felt that the manner in which the organization arranges and implements ESH strategy within the organizational structure is through an adaptive strategy. For each of the three components under the organizational structure element, the questions started from this level.

Component 1 (Arrangement) – The organizational structure can be characterized as a functional-staff arrangement that does exist outside of regular ESH staff. This 'functional-staff' includes production staff and managers that help the ESH staff in handling ESH priorities. The ESH structure is connected to all functions the experience risks to the resources they control. When faced with new regulatory actions, the organization brings together legal and operational staff to review possible efficient solutions. The organizational structure of the ESH function primarily follows a proactive strategy with an aspect of the adaptive strategy in how the structure is characterized.

Component 2 (Direction) – Direction for structuring ESH efforts is provided through incident investigations, monthly audits, insurance carrier expectations, and the needs of external regulatory agencies. These efforts are focused on developing policies, providing technical advice on compliance matters, and controlling hazards.

Responsibility for structuring the ESH function is assigned to a moderate sized team of specialists with the power to integrate activities both horizontally and vertically within the organization. Overall, the direction for structuring ESH efforts primarily follows an adaptive strategy with an aspect of a proactive strategy in who is responsible for designing the structure.

Component 3 (Functional Positioning) – The organizational positioning of the ESH function is undistinguished and buried within the organizational chart of the firm. The function reports to a mid-level operational manager. This functional positioning of the ESH position firmly follows an adaptive strategy.

Table 4.3 – Financing Results

		Developmental Levels			
		Resistive	Adaptive	Proactive	Sustainable
Components	Financial Arrangement			x	
	Access to Financial Resources			x x	
	Financial Tools		x	x x	

In response to the initial question, the interviewee felt that the manner in which the organization intends on funding ESH activities is through a proactive strategy. For each of the three components under the financing element, the questions started from this level.

Component 1 (Financial Arrangement) – The financing of the organization's ESH function can be classified as a contingent liability focused arrangement. This classification firmly follows a proactive strategy.

Component 2 (Access to Financial Resources) – Financial resources are accessed when ESH budget requests are intended to improve compliance levels and better manage the risk to human and material resources. The funding level tends to be at industry levels and included into the overall budget of the core business units needing ESH oversight. The access to financial resources for the ESH function firmly follows a proactive strategy.

Component 3 (Financial Tools) – Financial tools for performing financial and economic analysis of ESH practices are mainly focused on cost-benefit analyses. Costs accumulated through the use of cost accounting systems are reported on a regular basis for management information purposes. Different ESH program costs may be hidden in general overhead accounts depending on whether or not they are considered a capital expenditure. This organizational structure of the ESH function predominantly follows a proactive strategy with an aspect of an adaptive strategy in how some ESH program costs are hidden in overhead accounts.

Table 4.4 – Technical Results

Components	*Developmental Levels*			
	Resistive	Adaptive	Proactive	Sustainable
Technical Tools		x x x		
Planning Processes and R&D		x x x	x	
Training	x x			

In response to the initial question, the interviewee felt that the manner in which the organization intends on creating and transferring technical knowledge used to

manage ESH issues is through an adaptive strategy. For each of the three components under the technical element, the questions started from this level.

Component 1 (Technical Tools) – The organization looks at technological changes as a way to address regulatory compliance problems. ESH tools, such as MSDS chemical software, are used to fulfill regulatory reporting requirements. The focus of these tools is the periodic, intermittent, general recognition, and recording of ESH information. This information is used in formal reports and process modifications. This technical tool usage and mindset firmly follows an adaptive strategy.

Component 2 (Planning Processes and R&D) – ESH technical considerations are included in planning processes and R&D on an ad hoc basis. These considerations are formulated in reaction to current and imminent compliance problems but are seldom a factor in deciding if a product is produced or not. Rather than rely on traditional 'end-of-pipe' controls, the organization tackles what few environmental problems they face with clean technology, toxic use reduction, and pollution prevention. When considering ESH issues in the planning stages, the organization falls within an adaptive strategy. But when addressing issues after they arisen, it utilizes a more proactive stance.

Component 3 (Training) – The organization does not conduct any relevant training in the ESH technical area. Management has accepted that employees will not look for innovative ESH ideas because they feel that is a minimal ESH burden within the production and manufacturing phases. The ESH training strategy is firmly resistive as this area is not very applicable to the organization.

Table 4.5 – Evaluation Results

Components	Developmental Levels: Resistive	Adaptive	Proactive	Sustainable
Process	x x			
Performance Tracking	x	x x x		
Assessment and Evaluation	x			

In response to the initial question, the interviewee felt that the manner in which the organization intends on evaluating ESH performance is through an adaptive strategy. For each of the three components under the evaluation element, the questions started from this level.

Component 1 (Process) – The organization does not have a formal evaluation process in place. The organization strongly believes that an evaluation system would offer no benefits in terms of productivity, efficiency, or liability reduction, as the risk is not high enough. When issues arise internally or externally, they are approached through a single one-time evaluation provided through the insurance carrier. This evaluation process resolutely follows a resistive strategy.

Component 2 (Performance Tracking) – ESH performance is tracked strictly through a limited set of accidents/incidents rates involving personnel. These measures are limited to tracking costs of accidents and fail to determine the efficiency of the underlying processes responsible for the harm. Environmental performance that looks at the amount of materials utilized and subsequent wastes are not tracked. The performance tracking with respect to the safety burden follows an adaptive strategy. But all environmental and material usage tracking follows a resistive strategy.

Component 3 (Assessment and Evaluation) – Assessment and evaluation of the ESH function and its components does not take place. The personnel with the department are evaluated personally, but not the effectiveness of the ESH programs and the activities they implement. ESH assessment and evaluation firmly follows a resistive strategy.

Table 4.6 – Information Management Results

Components	*Developmental Levels*			
	Resistive	Adaptive	Proactive	Sustainable
Information Compilation			x x x	
Access		x x	x x	
External Reporting	x			

In response to the initial question, the interviewee felt that the manner in which the organization provides information to internal and external parties on ESH strategy control and progress is through a proactive strategy. For each of the three components under the financing element, the questions started from this level.

Component 1 (Information Compilation) – The information management uses an integrated approach that centers upon areas within the organization experiencing risk, danger, and loss. The focus of this information management is the early recognition and rectification of exiting and future ESH issues. By concentrating on the areas that hold the majority of the organization's ESH burden, this information alerts the ESH specialists how the organization is performing. This ESH information compilation firmly follows an adaptive strategy.

Component 2 (Access) – Organizational access to ESH information is internally provided through hard-copy documents from spreadsheet and test applications, with the intranet as a supplement. The extent of the information usually concerns a limited number of regulated processes over set time periods. The communication of the ESH information, strategies, and progresses are the responsibility of a core group of ESH staff located in the central operations area. Furthermore, this group utilizes specialized software programs that help comply with ESH laws and regulations (e.g., Compliance Plus software). The ESH information access strategy uses an equal blend of adaptive and proactive characteristics.

Component 3 (External Reporting) – Reporting to the external environment does not take place because the organization does not see the potential benefit to disclose the small amounts of materials it uses and pollution it releases. This ESH external reporting strategy is definitively resistive.

4.3 Interpretation of Results

The results should be viewed as a guide to help the organization understand how their ESH objectives and strategic intent are being realized through the decision making process. Of the eighteen ESH strategy components evaluated (six elements x three components each), seven of them principally follow an adaptive strategy, six follow a proactive strategy, four follow a resistive strategy, and one is a mix of both. Table 4.7 provides a simplified version of how each component was rated. This can be used to identify future areas of improvement. Conversely, the organization might find

that it is spending too much time, effort, or funds on a proactive component and needs to bring it down to a more adaptive level. Only the financing element had all its components fall under a single developmental level. It is possible that the organization is not aware of how certain components of their ESH program can operate under different strategy levels and should be taken into consideration. These can now be identified and investigated to see if corrective action would be beneficial to the ESH program and its relation to the business aspects of the organization.

It should be stressed again that a resistive strategy is not necessarily worse than a sustainable one. Depending upon the organization's exposure to risks, dangers, and losses from ESH issues, an organization should spend only the time and effort that is necessary to achieve their objectives. It can be theorized that the organization would strive toward all the elements existing within a single developmental level. Why would you proactively finance an ESH program that performs evaluation in a resistive manner? This is for the organization to decide after the assessment tool has identified it.

4.4 Use of the Assessment Tool

Beginning with a broad question at the beginning of each element greatly helped in narrowing down which level of questions to ask. This speeded the process of identifying the strategy level and prevented inappropriate questions from being asked. When a majority of 'no' answers were given within a level, it was easy to jump up or down a level until the answers were affirmative. In the event when only a single or a

Table 4.7 – Comprehensive Strategy Assessment Results

Elements with Component Breakdown		*Developmental Levels*			
		Resistive	Adaptive	Proactive	Sustainable
Strategic Plan	1st		X		
	2nd		X		
	3rd			-X	
Org. Structure	1st			-X	
	2nd		X+		
	3rd		X		
Financing	1st			X	
	2nd			X	
	3rd			-X	
Technical	1st		X		
	2nd		X+		
	3rd	X			
Evaluation	1st	X			
	2nd		-X		
	3rd	X			
Information Mgmt.	1st			X	
	2nd		X(both)	X(both)	
	3rd	X			

A '+' indicates that one aspect of this component was rated at the higher level.
A '-' indicates that one aspect of this component was rated at the lower level.

couple of questions within a level were answered 'no', then a similar question was asked from the proceeding or preceding levels if possible. As the levels are progressive, and contain different amounts of information, sometimes a similar question is not present in another level as it is only applicable to that one level.

The administration of the assessment tool brought to light some concerns on its user friendliness. The questions were found to be too complex when asked outright to the interviewee. The questions are subjective, which results in some ambiguity when trying to give a definite answer. As virtually all the questions are not quantifiable, the interviewee had difficulty in giving an answer that could be supported with specific

examples. Occasionally the interviewee related that the company is striving for certain goals, but these have yet to be achieved, or may never be achieved. Without asking for more specific information, the interviewee felt biased in giving what she thought was the right answer.

It was suggested that the questions are rephrased in layman's terms that could be understood by any professional without in-depth understanding of business or ESH concepts. Unless the interviewee can feel completely comfortable in the interpretation of the questions, the usability of the assessment tool suffers. To help in the comprehension during the pilot study, a copy of the questions was provided as a visual reference. Ideally the questions should be easily understandable, so that a visual reference is not required.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

Environmental, safety, and health issues have taken on a greater importance in organizational decision-making. As the ESH function is responsible for controlling the risks, dangers, and losses that natural and human resources are exposed to, this function's effectiveness can affect all business operations. Consequently, this has created a demand by management to assess the manner that ESH issues are being approached. Unfortunately, an approach does not exist for qualitatively assessing the ESH and sustainable development strategies and linking it to the overall competitive strategy of the organization.

This research aimed to identify the current ESH strategies and incorporate them into an assessment tool that can be applied in an organizational setting. The first step was to determine the elements that comprise a typical Environmental Management System that handles an organization's environmental, safety, and health burden. Six elements were identified that included: Strategic plan, organizational structure, financing, technical, evaluation, and information management. Secondly, an intensive literature review was undertaken that examined the manner in which ESH issues were handled across all industries. Through examples and case studies, the aim was to gather the strategic intent of what these actions proposed to accomplish in the short and long terms. These were categorized under four distinct strategy developmental levels: Resistive, adaptive, proactive, and sustainable. These

developmental strategies were listed for each of the six elements that make up an Environmental Management System.

Each of the elements, and its four possible developmental strategy levels, were peer reviewed twice by an expert in the applicable field. The objectives of the peer review were to ensure that the information in each of the strategy levels was appropriate under each element, the strategy levels were progressive in nature, and that a similarity could be seen when comparing the strategy levels of different elements. The reviewer comments focused primarily on word usage, sentence structure corrections, and confusing statement definitions. As the comments only included superficial changes, and supported the content of the material, a second round of reviews was not required.

With the strategic developmental levels finalized, the statements under each strategy level, for each element, were transformed into 'yes/no' questions. This was the framework that would qualitatively assess the organization's strategic intent. On August 20th, 2001 an assessment was completed of a 1000+ employee high-tech organization with its corporate headquarters in Portland, Oregon. Members of the ESH department were interviewed and asked questions from the possible strategy levels. Receipt of 'yes' answers indicated that the organization did follow that particular strategy. In the case of 'no' answers, the interviewer moved up or down a level until the majority of the answers were of the affirmative. The results were provided to the organization in the form of tables that illustrated where the elements of their Environmental Management System were on the strategic continuums. It was uncovered that the organization embraces ESH strategies from the resistive, adaptive,

and proactive levels depending upon the element in question. This information should be used as a guideline to identify potential areas of improvement and inconsistencies between the elements. Although the strategy levels are progressive in nature, i.e., sustainable is more active than resistive, each should not be viewed as better or worse than another. Depending on the level of risk the organization is experiencing it may be ideal to follow a 'lower' strategy level. Future developments of the assessment tool will help establish which strategy is the most beneficial and suitable one for an organization. This is discussed in section 5.3.

5.2 Conclusions

The study identified the available ESH strategies that exist and incorporated them into a qualitative assessment tool. Use of the assessment tool at a high-tech manufacturing plant demonstrated the effectiveness of the tool in identifying potential areas of improvement in the ESH function. The corporate ESH manager strongly felt that the tool is valuable for providing direction in how to plan their ESH activities. Although the tool's reliability and validity have not been ascertained, it does put an organization in a position to evaluate how the elements of its ESH function match or differ in their strategic activities. Use of this assessment tool is the first step an organization needs to take to understand where they exist in the scale of ESH strategies, and if this is the ideal strategy to follow.

5.3 Recommendations for Further Research

The assessment tool was based upon information across all industry types and from all different sizes of organizations. The next logical step in the tool development is to specify the strategic information to each industry type . As the tool can be currently thought of as a general typology of ESH strategies, it can be used as a template to develop the particular strategies encountered in a specific industry (e.g., construction, semi-conductor, petroleum). Using explicit examples and terminology from a particular industry will increase the user-friendliness of the assessment and avoid some of the concerns that were experienced in the pilot study.

This can be also broken down further by distinguishing between the developmental strategy levels between small and large organizations. Smaller organizations will typically have a smaller budget and pool of resources in which to tackle ESH issues as these companies will often have a lesser ESH burden to begin with. Therefore, the available ESH developmental strategies will differ depending upon the size of the company. Small organizations are not condensed versions of large corporations and thus necessitate their own precise ESH solutions. A sustainable strategy for a multi-national manufacturer would vary with those from a local manufacturer with 40 employees. Both may embrace an ESH sustainability strategy, but the manner in which they pursue this will not be the same. Some of the actions that a larger organization would take might be too costly, too labor intensive, and simply not necessary in a smaller organization. Alternatively, small organizations can respond to challenges such as sustainability with greater efficacy than larger organizations

because they are more independent and flexible (Storey, 1994). By redesigning the assessment tool to match the industry type and relative size of the organization, its appeal and value will increase.

One of the issues that arose during the pilot study was the distinction between whether or not the organization's actions, or lack of, followed a resistive strategy or if the question was basically non-applicable to the situation. By tailoring the questions specifically to the industry and size of the organization, all strategies should be applicable so that strategy components that are missing can confidently be assessed as resistive.

The assessment tool should then be tested to see the extent to which the assessments are consistent and free from error. A reliable tool should obtain the same results with repeated administrations of the assessment under set conditions. A test-retest reliability assessment can establish that the tool is capable of measuring the strategy levels with consistency. Depending upon if a single researcher or multiple researchers will use the tool, intrarater or interrater reliability should also be determined to strengthen the accuracy of the data. Test-retest, intrarater, and interrater reliability can all be analyzed using the intraclass correlation coefficient (ICC), as it reflects both the correlation and agreement of the results.

Concurrent with testing the tool for reliability, the extent to which the tool measures what it is intended to measure should be researched. This 'validity' of the tool emphasizes the ability to make inferences about the organization from the strategy assessments. Within the four domains of validity, the most relevant to this study is the construct validity. Construct validity reflects the ability of a tool to measure the

abstract concepts (constructs) that are the strategy profiles. Establishing construct validity is an ongoing process that comes about through repeated testing and use of the tool. One suggested approach in confirming the construct validity is through the use of factor analysis. The questions under each of the ESH elements represent variables that provide an evaluation of the available strategy levels. A valid ESH strategy assessment tool should be able to measure and discriminate among these different strategies.

With the reliability and validity of the tool established, a company possessing resistive, adaptive, or proactive strategies may wish to move up to the next developmental level. But how does management know if this is the right action to take? This tool has been considered as the first part of a three part series of assessment tools that accurately determines the ideal strategy in which to run an organization's ESH program. Future secondary and tertiary assessment tools could evaluate the ESH costs within an organization and the level of risk encountered. Knowing the cost incurred and the existing risk will present a powerful case to management in whether the strategy a particular element is following is the right one for the situation. An organization with high exposure to risk and substantial ESH costs may not want to follow a resistive or adaptive strategy that basically takes cares of problems after the fact. Conversely, it may be possible that a company finds that it should decrease its ESH strategy level if the costs and risks do not warrant a higher manner in handling these ESH issues. Using these tools as a starting point, a future researcher might develop a framework of the steps, resources, time, budget, and efforts involved to advance between the ESH strategy levels.

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APPENDICES

Appendix A Profile for the Technical Element

Technical Strategy

The manner in which the organization intends on creating and transferring technical knowledge used to confront and manage, environment, safety, health, and sustainable resource development issues.

Level 1 (Resistive):

The technical strategy at this level can be characterized as permanently maintaining the present level of technical competencies and capabilities without effort for advancement. No tools exist or are externally adapted to be used on ESH issues within the organization. The organization refuses, or is unaware, of the risks and losses associated with failing to adequately assess the efficiency and effectiveness of organizational resources and processes.

ESH technical considerations are lacking in organizational planning processes and R&D. The organization's technical functions tend to support short-term projects with little, if any, deliberation on ESH issues within the product or process. The organization is not aware of, chooses to ignore, or is not interested in external developments in applicable technology and of how this could affect the ESH burden, or opportunities, inherently present in the operations.

The organization does not conduct any relevant training in the ESH technical area. Management assumes and has accepted that employees will not provide potential value to the organization as they are denied technical training in ESH issues.

Level 2 (Adaptive):

The technical strategy at this level can be characterized as being dependent upon technology changes applied to addressing regulatory compliance problems. Only ESH tools {e.g., MSDS software, Job Safety Analysis (JSA)} that fulfill regulatory reporting requirements by state and federal administrations are exercised at the organization. The focus of this tool usage is the periodic, intermittent, general recognition, and recording of ESH information for use in formal reports and process modifications. Tool utilization, maintenance, and subsequent decisions rarely leave the responsibility of the ESH specialists.

ESH technical considerations are included in organizational planning processes and R&D on an ad hoc or adaptive basis. These considerations are seldom a factor in determining if or which product is produced. Considerations are primarily formulated in reaction to current and imminent urgent problems, compliance with regulatory requirements, or in response to explicit requests from business customers. The organization sees no relevant market or strategic opportunity in developing ESH technical innovation and favors short-term solutions mainly through the adoption of end-of-pipe technologies.

Limited and basic technical training sessions are focused on meeting regulations and ensuring current and future compliance. Specialized technical training on ESH issues for engineering, design, and R&D personnel does not exist above that which is available to all employees. Additional attempts at ESH awareness in developing product processes, procedures, and tools are not evident.

Level 3 (Proactive):

The technical strategy at this level can be characterized as promoting technological change for production purposes (i.e., main business innovation). The organization has adopted a continuous and interval application of environmental and safety assessment tools {e.g., Detailed Hazard Analysis (DHA), Product Line Analysis (PLA), Environmental Site Assessment (ESA), HazOp Analysis} to manage quantities of natural resources used, wastes produced, hazard exposure, and contingent liability. Tool attention is focused on current and future detection, interpretation, and modification of ESH impacts and risks associated with operations. Management decision-making processes are dependent on these tools to provide the assessments that initiate strategic action within this function.

ESH technical considerations are included in organizational planning processes and R&D on an opportunistic basis. The organization permanently monitors developments, changes, and trends in ESH technologies, but does not systematically and consistently incorporate it with planning. The organization pursues technical development in elected regulatory-driven projects, projects aimed at improving ESH and business performance, and projects exploring new product/process opportunities. The firm has built a technical understanding and capacity for linking ESH innovation with improved organizational competitiveness. Distinguished from traditional add-on 'end-of-pipe' controls, the new innovative initiatives undertaken encompass pollution prevention, toxic use reduction, and clean technology.

Dedicated technical training is conducted for all employees involved in product design, production processes, and resource utilization aspects. Management has recognized that a proactive approach to enhancing compliance is a knowledgeable, environmentally aware work force. Technically competent employees are expected to better position the company to deal with the regulatory framework and develop cost-effective solutions when available. The technical training is conducted internally (mentoring, on-the-job training) and externally (consultants, conferences, meetings, professional journals) and focuses on developing ESH awareness within the mindset and methodologies of the employees. Traditional job tasks are expanded to include ESH concerns so that they may be reflected in both design and operational criteria of the organization's technology.

Level 4 (Sustainable):

The technical strategy at this level can be characterized as routinely allocating resources to maintaining a technical knowledge foundation and developing core technologies and new tools for improving technical productivity. The firm has

invested in an extensive compilation of ongoing ESH and economic tools {e.g., Life Cycle Analysis (LCA), Total Quality Assessment (TQA), Environmental Impact Assessment (EIA)} to investigate environmental, safety, health, financial, and social effects of the organizational processes and their impact on organizational competitiveness. Tool attention focuses on the comprehensive identification and modeling of: The risk, loss, and dangers that resources are subjected to, quality and financial effects from ESH issues, future liabilities, and organizational sustainability. Management relies on the strategic choice of tools, strongly related to organizational ESH objectives, to support research and technology decisions and serve as a baseline to improve ESH performance and sustainable development practices.

The strategic consideration of ESH technical innovation is fully embedded and linked within the project planning processes, R&D, and business operations. These ESH considerations are seen in the overall broad organizational picture, and improved technical efficacy is recognized as a strategically potent means for obtaining competitive advantage. ESH R&D projects are viewed as key investments to the future of the company that will address resource threats and opportunities. Technical productivity enhancements are sought that balance strategic objectives with current needs by developing core technologies and new tools. The organization is recognized as continually surpassing industry benchmarks and setting the standard of technological ESH innovation. Initiatives focusing on technical change address multimedia pollution sources and reflect fundamental shifts in the design and reformulation of products and processes (Design for Environment, Safety, and Health).

Strategically tailored technical training programs are developed for all design, scientific, pre-production, production, and R&D functions to ensure a consistency with sustainable organizational development. Management has found it financially and competitively advantageous to stay ahead of regulations and competitors and respond to current public attitudes toward ESH issues through technical development. The technical training initiated by the organization occurs regardless of the existence of regulatory requirements and meets or exceeds the industry average. The majority of technical training programs is carried out internally (mentoring, job rotation, workshops, communities of practice) and is supplemented by external opportunities (universities, conferences, partnerships). Both explicit and tacit technical knowledge transfer of ESH issues and procedures within the organizational products, processes, and tools are integrated in the training for use in a common context. Trained employees are accountable for viewing and considering ESH matters equally with other product/process concerns (costs, marketability) when performing all job tasks.

Appendix B Profile for the Evaluation Element

Evaluation Strategy

The manner in which the organization intends to evaluate ESH performance and sustainable resource development practices.

Level 1 (Resistive):

Performance evaluation at this level can be characterized as a nonexistent process. The organization strongly believes that expenditures on ESH improvement represent costs that offer no corresponding benefits in terms of productivity, efficiency, liability reduction, public perception, and competitiveness. Therefore, it makes no sense to evaluate an organization's ESH performance and how it reflects on its overall business strategy.

ESH performance is not tracked or considered in the operational evaluations of the organization. There is an inability to define relevant activities, an inability to quantify efforts and funds spent on ESH actions, and an undefined relationship between these activities and their operational impacts. Attempts to evaluate single elements of the organization's ESH burden are initiated only in response to regulatory mandates and subject to change.

Assessment and evaluation of the environmental management system and its components does not take place, as an already meager effort, structure, and activities comprise the ESH program.

Level 2 (Adaptive):

Performance evaluation at this level can be characterized as a process to identify and monitor only those processes that affect the regulatory compliance stance of the organization. There is a lack of belief in empirical evidence or analysis that organizational ESH activities impact the business success of the organization (outside of the legal perspective). The driving force influencing the organization's evaluation methods are the increasingly stringent regulations regarding ESH impacts on its procedures, products, and production processes.

ESH performance is tracked through a set of indicators with a limited focus on failure rates and end-of-pipe controls for activities under regulatory control. These measures are limited to tracking costs, emissions, accidents, or other compliance related outputs, and fail to adequately determine the efficiency or effectiveness of the underlying process. This focuses strictly on the environmental burden on the organization and accidents/incidents involving human resources.

Assessment and evaluation of the environmental management system and its components is conducted through a limited set of self-audits focused on technical compliance with laws and regulations. The audit process is not intended to monitor

indicators of daily compliance since direct responsibility rests on division managers or their equivalent. Self-audits from these divisions are regularly carried out and are basically reports stating 'yes; we are' or 'no; we are not' in compliance. This system is not geared to taking a holistic look at the organization's approach to ESH management or helping management devise better procedures to reduce ESH costs and impacts.

Level 3 (Proactive):

Performance evaluation at this level can be characterized as a system intended to anticipate, identify, and monitor all activities and processes within the firm, which affect organizational resources. Management attitudes have evolved beyond a strict concern for compliance by realizing the potential of substantial financial benefits from improved ESH performance. The foremost driving force influencing the organization's evaluation techniques is a commitment to ESH stewardship for managing risks to resources, minimizing accidents/incidents, and improving overall performance. Evaluation is viewed as a tool to accurately assess and recognize performance levels and potential areas of improvement.

ESH performance is tracked through numerous performance indicators throughout areas of operational systems, management systems, and the environment. Major attention is focused on choosing indicators that demonstrate continuous improvement, identify weak spots in the system, allow for more efficient distribution of resources, and provide a mechanism for assigning accountability for ESH risk, danger, and loss results. A high priority is placed on developing indicators for each organizational activity that reflect the goals, objectives, and targets, thus adding definition and support to corporate ESH policies. Tracking progress toward established goals serves to influence behavior by providing continual feedback, and requires reliable and consistent metrics to be assigned under the chosen indicator areas. Metrics, chosen for the broader indicator areas, are recorded qualitatively and quantitatively, and accurately portray amounts, costs, time, efficacy, and contingent liabilities. The organization also investigates and implements, to the greatest degree practicable, metrics representative of current best practices in its industry for use in benchmarking. Systematic comparison of industry performance benchmarks and best practices of competitors is viewed as an opportunity to provoke questions about ESH performance and opportunities for improvement.

Assessment and evaluation of the environmental management system and its components is conducted through audits with an expanded scope beyond compliance to include risk assessments of unregulated activities. The focus is upon how the organization's ESH systems identify the business process points that impact resources, measure the potential for damage, mitigate the risks represented, and initiate control. Audits are carried out according to risk-based factors, including the complexity of the facility/operation, intricacy of the regulatory environment, past compliance performance, continuity of the personnel involved, elapsed time since the most recent audit, and influences on the organization's financial standing. By assessing the

effectiveness that the business and ESH process systems manage environmental risk; this organizationally integrated audit series impacts the business cycle of the firm.

Level 4 (Sustainable):
Performance evaluation at this level can be characterized as an all-inclusive process to assess ESH implementation and outcome measures in organizational procedures, activities, and all resource utilizations in order to ensure maximum efficiency. The organization views ESH performance as a definitive area of competitive advantage and as a gauge of the sustainability of the organization. The driving force behind the evaluation methodology is to increase profitability through sustainable development practices. The purpose of the performance evaluation is to change behavior to fit this organizational goal. The organization has realized that they can only effectively manage what they measure; therefore ESH evaluation has a permanent and highly integrated presence.

ESH performance is tracked through a combination of fundamental environmental and more strategic indicators that detail where they are, where they were, and where the organization wants to be. This mix of lagging and leading indicators allows management to prioritize past problems, address their most pressing issues, and seek business opportunities. The choice of indicators is driven by the organization's objectives, policies, goals, and the potential gain of competitive advantage with regard to significant success factors, including profitability enhancement, regulatory positioning, market access, and stakeholder approval. This is accomplished through the designation of applicable metrics within the indicator areas that are relevant to economic competitiveness (i.e., resource consumption, waste recovery, compliance costs, etc.). Metrics are recorded qualitatively, quantitatively, absolutely, aggregated, and index/weighted for increased accountability, standardization, and comparability over time to produce trends, which can be benchmarked against other companies or industries. These metrics are recorded on balanced scorecards to help management keep pace with the sustainability of the organization from both an environmental and financial standpoint. Developing scorecards for crucial ESH performance and business metrics help senior-level management track results, and also enables stakeholders to verify results in ways that can maintain the organization's reputation and sustainability. The balanced scorecard links vision and strategy with performance indicators and subsequent metrics to provide the basis for the strategic ESH measurement and management system.

Assessment of the environmental management system and its components is conducted through a comprehensive variety of audits, differing in type and frequency, to monitor overall compliance and determine the efficiency and effectiveness of the organization's ability to protect and use resources productively. These audits range from daily self-assessments to a detailed external audit. Self-audits consist of equipment inspections, job procedure checklists, and other routine practices conducted on a daily basis. Internal audits ensure compliance with company objectives, industry initiatives, and governmental regulations, as well as reduce current ESH costs and

future liabilities. Furthermore, this internal system provides the basis for practical planning and control and for external audits that rely heavily on information submitted by the organization. External audits provide senior management with independent verification and analysis of the competencies, capabilities, and deficiencies of the ESH program and confidence that all issues are being addressed. The enhanced, all-inclusive process results in a more proficiently integrated ESH program that reduces liability, prevents losses, reduces costs, fosters profits, and leads to increased sustainability of the organization.

Appendix C Profile for the Information Management Element

Information Management Strategy

The manner in which the organization provides information to internal and external parties (customers, stakeholders) on ESH strategy control, progress, and sustainable resource development.

Level 1 (Resistive):

The information management strategy at this level can be characterized as an incomplete, unorganized, or fragmentary compilation of information pertaining to ESH issues within the organization. A history of insufficient data generation and recording activities has lead to a piecemeal collection of information. With a mentality of responding after the fact to ESH issues, there is a lack of focus on organizing existing information into a coherent and continuous outline. Often, important ESH information is gathered and compiled only by necessity after receipt of fines and mandates by regulatory agencies.

Organizational access to ESH information internally is confined to the point of origin of the data. Information available is not present beyond the actual process, department, or area in which it was generated. Communication of ESH strategy, control, and progress does not take place unless initiated in response to regulatory mandates and involves as few people/resources as possible. Additional information transfer of performance, issues, and concerns of the firm in this area are informal, unplanned, and not expected of the organization as a whole.

Reporting to the external environment does not take place because the organization does not want to, does not believe it needs to, or sees no potential benefit in disclosing the ESH performance level and status of its operations.

Level 2 (Adaptive):

The information management strategy at this level can be characterized as a fragmented approach that centers on targeted areas within the organization. Its focus is upon those processes and activities that dictate the regulatory and legal standing of the organization. At this level, knowledge management of these areas aims to fulfill required reporting formats designated by occupational and environmental regulators.

Organizational access to ESH information is internally available as a limited number of hard-copy graphs, spreadsheets, figures, and tables. These documents are accessible within the department where it was generated and within the ESH function. The extent of the information encompasses only a limited number of regulated processes over specified time periods. This information composition is based upon simplicity and comparability between previous and present time intervals. Communication of ESH strategy, control, and progress is the responsibility of a core group of ESH specialists located in central operational areas encountering regulatory compliance concerns.

Information is presented to mid-level management responsible for a particular department. Each individual overseeing the information collection of a specific operation, and subsequent reporting, works independently of similar employees in different areas. This ad-hoc arrangement creates a limited, vertical flow of information confined within each department.

Reporting to the external environment takes the form of annual organizational ESH reports relating to the firm's level of regulatory compliance. These hard-copy reports are limited in ESH information and are publicly available only upon request.

Level 3 (Proactive):

The information management strategy at this level can be characterized as an integrated approach that concentrates upon information from areas within the organization experiencing risk, danger, and loss. The organization believes that information from these areas has the same worth as operational information from different departments and can equally affect the competitiveness and profitability of the firm. The focus of the organization's ESH knowledge management is the early recognition and rectification of existing and future issues while keeping in mind how it contributes to the performance of the firm. Certain processes and activities within the organization are viewed as having a higher ESH cost and subsequent contingent liability. Information management efforts (collection, processing) are concentrated towards those areas that are deemed to hold the majority of the organization's ESH burden.

Organizational access to ESH information internally is provided through hard-copy documents from spreadsheet, text applications, databases, and the intranet/internet as a supplement. ESH information is recorded and available from all performance entities (division, processes, etc.) and is displayed using a standardized format. This arrangement is based on easy comprehension and availability. Utilization of specialized software programs typically involves tools for complying with ESH laws and regulation (Health and Safety software, Environmental Cost Assessment software). Communication of ESH strategy, control, and progress is transmitted through lines of responsibility and accountability established throughout designated functions. This interaction among personnel lines takes the form of scheduled meetings and discussions that concentrate on how the information affects the competitive, financial, and regulatory status of the organization. Increasingly upper-level and senior level management are involved in the meetings and communication pathways, but this is not a permanent arrangement.

Reporting to the external environment is a repeated voluntary initiative stemming from the pressures of various groups that have a direct interest in the ESH performance of the organization. The organization has a desire to demonstrate a responsible and proactive attitude toward ESH issues in view of awareness from shareholders, banks, local communities, corporate customers, employees, and business analysts. Reports

are published, and available on-line concurrently with the financial reporting of the organization and communicate ESH commitment, targets, and performance.

Level 4 (Sustainable):
The information management strategy at this level can be characterized as a holistic approach that balances and incorporates all relevant human, operational, organizational, and technological components of the firm. Since ESH information, issues, concerns, and innovation are deeply rooted in the employees and framework of the organization, efforts concurrently address all components of the firm as a single system and not as separate elements. The focus of the firm's ESH knowledge management is to create economic value, which leads to increased organizational sustainability. The information and knowledge gained on ESH progress and control is not valuable unless utilized. Furthermore, it must be used where it has the greatest economic potential of spurring growth, eliminating liabilities, dangers, losses, and consequently maintaining sustainability. The organization places a high emphasis on applying knowledge management (collection, processing, reporting) to higher risk business processes whose improvement will create a significant return on investment. This investment often takes the form of increased productivity or efficiency where the traditional burdens of accidents, environmental incidents, and resource losses are identified and can be minimized.

Organizational access to ESH information internally is composed of a combination of software applications, databases, and on-line sites that can be accessed from computer terminals throughout the organization. This system is based upon speed, user-friendliness, and inclusiveness. Information is processed and stored by employees with direct/indirect accountability and influence on particular activities. Various software programs that go beyond compliance are utilized to identify areas for improvement and speed the consolidation of relevant ESH information into reports based on a specific product, location, process, division, or time period. The use of these programs allows for more efficient and all-inclusive reports that draw attention to the regulatory and competitive stance of the company. These reports are made internally available primarily through intranets and the internet. Using these electronic media provides all levels of management access to a central database in which necessary ESH performance information is stored. Information is presented in diverse and interactive formats with multimedia software. This allows for rapid access and releases the organization from the constraints of time and space associated with traditional forms of ESH management communication. Communication of ESH strategy, control, and progress is conducted through regular and frequent meetings between a cross-section of employees at different levels and divisions of the organization. These multi-disciplinary meetings include designated representatives from the pertinent areas with a twofold duty to an ESH assignment and their department. Due to the awareness of how ESH performance and regulations affect the business decisions of the organization, senior level executives are a permanent and necessary fixture at the meetings.

Reporting to the external environment is given an equal priority as the internal information system flow. To maintain a favorable reputation and enhance the attractiveness of the organization, public dissemination of ESH strategy, control, and progress is provided. This is accomplished through publishing, and providing on-line, specific ESH targets, identification of the lines of responsibility for ESH issues, program successes and limitations, and quantitative performance data. Performance improvements to the organization's ESH activities are also made public through targeted environmental communications to all stakeholders and the financial community.

Appendix D Profile for the Strategic Plan, Structure, and Financing Element

The profiles for the Strategic Plan, Organizational Structure, and Financing element were developed in a research study by Dr. Anthony T. Veltri. Information on the profiles can be received through contact with Dr. Veltri at the following address.

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Appendix E Assessment Questions for Strategic Plan

(Below is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe the manner in which your organization intends on confronting and managing environmental, safety, health, and sustainable resource development issues?

(Resistive) – There is a minimal and reluctant effort extended with a tendency to respond to ESH issue only after the fact

(Adaptive) – There is a reactive, narrow and predominately technical effort focused on the mechanics of complying with ESH regulations.

(Proactive) – There is a broad technical and strategic management effort extended with a tendency toward accepting and internalizing ESH issues.

(Sustainable) – There is an extensive and forward-looking strategic management, finance, and technical effort focused on the competitive value of ESH practices.

Each of the three components for the strategic plan element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Organizational Response) under Strategic Plan

(Resistive) – Do you respond after the fact to ESH issues? Yes/No
– Do your responses usually fall short of what is necessary for strategically confronting and managing these issues? Yes/No

(Adaptive) – Are your responses dependent and driven by ESH regulatory issues? Yes/No
– Are your responses usually without regard to how they strategically fit and contribute to the competitive aspects of the organization? Yes/No

(Proactive) – Do you constantly push for the detection and correction of current and anticipated ESH issues? Yes/No
– Do these responses usually pay attention to how it strategically fits and contributes to the competitive and regulatory performance of the organization? Yes/No

- Are ESH improvements generally permanent and ongoing, but not always fully integrated into the business aspects of the organization? Yes/No
- Has an ESH committee been established to perform monthly inspection that serve to provide feedback on physical violations that need to be corrected? Yes/No

(Sustainable) – Do your strategic responses to ESH issues aim to enhance economic growth and sustainability of the organization? Yes/No
- Are ESH issues considered at the earliest possible stage in the productive life cycle design of products, services, technologies, and processes? Yes/No
- Do these responses pay attention to how it strategically strengthens the organization's business fundamentals (e.g., earnings growth, financial strength and quality of management)? Yes/No
- Are these responses also influenced by organizational and societal expectations for sustainable resource development? Yes/No

Component 2 (Strategy Formulation Process) under Strategic Plan

(Resistive) – Are your senior level executives unconcerned about the ESH strategy formulation process for the organization? Yes/No
- Do your senior level executives see their organization's strategy as strictly driven by regulatory mandates? Yes/No
- Is compliance with regulatory standards considered an inevitable on-going threat that negatively conflicts with more important financial aspects, such as productivity and organizational competitiveness? Yes/No
- Are no conscious or deliberate efforts initiated to lessen the potential for negative ESH impacts? Yes/No
- Do covert activities that attempt to hide or cover-up violations to avoid compliance take place? Yes/No
- Is the organization uninterested in strategic planning and is unaware of the potential long-term economic effects? Yes/No

(Adaptive) – Are your senior level executive passive and detached from the strategy formulation process? Yes/No
- Do the senior level executives see their organization's ESH strategy strictly from a legal obligation? Yes/No
- Is compliance with regulatory standards considered as an important organizational fringe add-on that is a minor consideration in regards to business operating decisions? Yes/No
- Does management see the ability to be in compliance as an achievement? Yes/No

– While the organization's strategy may be driven by regulatory response, are implementation and abatement activities performed only at a minimal level to minimally meet the need? Yes/No

(Proactive) – Do your senior level executives promote how a well constructed, financed, and integrated ESH strategy can help improve operational performance? Yes/No
– Do these senior level executives look at ESH issues and regulations as opportunities to reduce risk and contingent liability instead of as unnecessary cost burdens? Yes/No

(Sustainable) – Do your senior level executives fashion ESH needs as a criterion for making business decisions? Yes/No
– In turn, do business needs also become a criterion for making ESH decisions? Yes/No
– Do these senior level executives understand that solid performance in the ESH area tends to serve as a proxy for other corporate behaviors, which tend to produce good business performance? Yes/No

Component 3 (Strategic Intent) under Strategic Plan

(Resistive) – Does a "get by with what you can" mentality exit that usually results in narrow and incremental solutions to ESH issues? Yes/No
– Is remedial action often lacking because of financial and technological deficiencies? Yes/No
- Is justification for failure to exercise remedial action based on financial and technological deficiencies? Yes/No
- Is it true that the organization does not posses a formal strategy, as a decision not to initiate or develop a strategy exists? Yes/No

(Adaptive) – Is a strategic intent that describes the organization's long-term ESH vision absent in your firm? Yes/No
– Does a mission statement exist that primarily focuses on maintaining regulatory compliance and incident reduction? Yes/No
– Is the strategic plan comprised of a small portfolio of short-term technical-command and control type initiatives principally driven by regulatory compliance issues? Yes/No
– Are the strategic objectives of the organization often based on such measurable results as "number of days without lost time accident" although without integrating the proper preparation and resource utilization to achieve these objectives? Yes/No
– Has ESH become part of operating decisions based on historical events where risks-dangers-losses have been significant enough to affect productivity? Yes/No

(Proactive) – Are genuine attempts made in formulating strategy and verifying that these attempts strategically fit with the competitive performance strategy of the organization on an annual basis? Yes/No
- Is the strategic intent to adapt imaginatively and effectively to ESH issues and regulatory compliance changes? Yes/No
- Is the strategic intent also aimed at improving the management of risk and contingent liability, while reducing the outlays associated with accidents/incidents, lawsuits, and boycotts? Yes/No
- Does the mission statement intend on preventing the causes of loss producing incidents and to minimize their effects? Yes/No
- Is the strategic plan comprised of a well-balanced blend of short and long-term objectives that tend to meet the needs and expectations of key internal organizational clients? Yes/No

(Sustainable) – Is the strategic intent to constantly build competencies and capabilities ahead of need and delve into sustainable resource development and use practices? Yes/No
- Is the mission statement focused on preparing, protecting, and reserving the organization's resources and spotting opportunities for revenue growth in sustainable new products and technologies? Yes/No
- Are the organization's strategic plans clearly matched with business objectives and focused on high-leveraged developmental and reform initiatives designed to deliver a unique mix of economic value? Yes/No

Appendix F Assessment Questions for Organizational Structure

(Below is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe your firm's approach for arranging and implementing environmental, safety, health, and sustainable resource development strategy within the organizational structure?

(Resistive) – There is a minimal and reluctant effort in structuring the ESH function and is primarily developed with a tendency to respond to ESH issue only after the fact.

(Adaptive) – There is a limited effort to structure the ESH function and is focused on the mechanics of complying with ESH regulations.

(Proactive) – There is a broad strategic management effort extended with a tendency toward structuring the function as to accept and internalize ESH issues.

(Sustainable) – There is an extensive and forward-looking strategic management effort focused on structuring the function to enhance competitive value of ESH practices.

Each of the three components for the organizational structure element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Arrangement) under Organizational Structure

(Resistive) – Can the organizational structure be characterized as having an undefined safety function that is shaped after regulatory mandated imperatives? Yes/No
- When facing mandated enforcement actions, does the company reluctantly comply? Yes/No
- Are only minimal efforts initiated toward program effectiveness within a prevailing "get by with what you can" mentality? Yes/No

(Adaptive) – Can the organizational structure be characterized as a functional-staff arrangement that exists outside of the regular environmental, health, and safety staff? Yes/No

– Do these 'functional-staff' tend to include production staff or managers who are also responsible for handling their ESH regulatory problems and priorities? Yes/No
– Does each department tend to perform according to the manager's level of taking responsibility for ESH? Yes/No
– Is the organizational structure connected to only those processes encountering regulatory compliance? Yes/No
- Is the organization not structured in a manner that properly assimilates ESH strategies into the existing business plan?Yes/No
- When facing existing and new regulatory and/or enforcement actions, does the organization react by delegating responsibility only to the ESH staff and not the functional staff? Yes/No

(Proactive) – Can the organizational structure at this level be characterized as a line-staff arrangement that is shaped by risks to resources, contingent liability, and regulatory priorities? Yes/No
– Is the structure organizationally connected to all functions within the firm experiencing risk, danger, and loss to the resources that they control? Yes/No
– When facing existing and new regulatory and/or enforcement actions, does the organization bring ESH, legal, and operationa l staffs together to find cost effective and efficient solutions? Yes/No

(Sustainable) – Can the organizational structure be characterized as a hybrid solutions based business arrangement that is shaped by the competitive performance standards of the organization? Yes/No
– Is the structure organizationally connected to the firm's products, services, technologies, and processes contributing to ESH risk and cost burdens? Yes/No
– When faced with new regulations, does the organization review its' products and operational processes by analyzing areas that present the highest level of risk and cost burden? Yes/No
– Does the organization view regulations as an opportunity to make production more efficient, rather than as an unnecessary cost burden? Yes/No

Component 2 (Direction) under Organizational Structure

(Resistive) – Does direction for structuring ESH compliance efforts tend to be principally provided by external regulatory agencies, insurance carriers, and internal committees? Yes/No
– Does responsibility for structuring activities tend to be assigned to an ESH coordinator and/or collateral duty specialist (often Human Resources or Bookkeeping) with limited authority? Yes/No

– Are efforts focused on complying with mandates required by regulatory authorities? Yes/No

(Adaptive) – Does direction for structuring ESH compliance efforts tend to be principally provided through internal inspections/incident investigations, corporate wide audits, and needs from core operating staff, external regulatory agencies, and insurance carriers? Yes/No
– Is responsibility for structuring ESH compliance efforts assigned to a small-centralized group of ESH specialists positioned and dispersed within the organization's core production areas? Yes/No
– Are efforts focused on developing policy, providing technical advice on regulatory compliance matters, and controlling occupational exposure hazards? Yes/No
– Is emphasis placed on preparing line levels to understand the intent and purpose of legislation affecting worker safety, health, and the environment? Yes/No

(Proactive) – Does direction for structuring ESH strategy tend to be principally driven by the internal needs and expectations of core business unit managers, design and process engineers, and external consultants? Yes/No
– Is responsibility for structuring strategy assigned to a moderate sized team of ESH specialists possessing a wide array of technical competencies and capabilities, with powers to integrate activities vertically and laterally within the organization? Yes/No
– Is major attention focused on risk identification, assessment and control, contingent liability reduction, enhancing regulatory compliance, and fostering environment, safety, and health responsibility among employees and external suppliers by encouraging their initiative and innovation to support ESH initiatives? Yes/No

(Sustainable) – Does direction for structuring ESH strategy tend to be principally driven by the competitive performance strategy of the organization, by internal and external operations research studies, corporate audits, risk and cost assessments, and special task force studies? Yes/No
– Is responsibility for structuring strategy assigned to a superimposed multi-level and interdisciplinary team of internal and external ESH specialists having dual allegiance to a particular ESH assignment and to their organizational department? Yes/No
– Is major attention focused on determining ways to enhance compliance with requirements authorized by governmental regulatory agencies and insurance carriers, counteract existing and potential risk to resources, reduce long-term contingent liabilities, and to lead the organization in activities that sustain the organization and its resources? Yes/No

– Does the function constantly reframe ESH issues into business and technological problems? Yes/No

Component 3 (Functional Positioning) under Organizational Structure

(Resistive) – Is an organizational positioning arrangement non-existent within the organizational structure of the firm? Yes/No

(Adaptive) – Is the organizational positioning arrangement undistinguished and buried within the organizational chart of the firm? Yes/No
– Does the function tend to report to a mid-level operational manager? Yes/No

(Proactive) – Is the organizational positioning arrangement somewhat distinguished and arranged on the same level as other major producing and servicing functions within the organizational chart of the firm? Yes/No
– Does the function tend to report to a vice-president involved in operations and/or finance? Yes/No

(Sustainable) – Is the organizational positioning arrangement well distinguished, internally and externally structured into the business strategy process of the firm, and reports to a senior-level executive? Yes/No

Appendix G Assessment Questions for Financing

(This is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe the manner in which your organization intends on funding environmental, safety, health, and sustainable resource development activities?

(Resistive) – There is minimal and reluctant funding distributed with a tendency to address the financial cost of ESH activities only after the fact

(Adaptive) – There is a reactive, narrow, and predominately limited distribution of funds focused on the mechanics of complying with ESH regulations.

(Proactive) – There is a broad funding effort extended with a tendency toward accepting, internalizing, and financing ESH activities.

(Sustainable) – There is an extensive and forward-looking funding effort focused on the competitive value of ESH activities.

Each of the three components for the Finance element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Financial Arrangement) under Financing

(Resistive) – Can the financing of the organization's ESH function be characterized as an informal pay-as-you-go arrangement? Yes/No

(Adaptive) – Can the financing of the organization's ESH function be characterized as a regulatory compliance focused arrangement? Yes/No

(Proactive) – Can the financing of the organization's ESH function be characterized as a contingent liability focused arrangement? Yes/No

(Sustainable) – Can the financing of the organization's ESH function be characterized as strategically opportunistic? This means having sufficient funding for the long-term, while having the financial wherewithal to remain flexible enough to solve new issues and support research and development and other opportunities for innovation? Yes/No

– Are business and ESH changes tightly interwoven? (i.e., Do changes in business operations affect the scope of ESH issues? Conversely, do changes in ESH regulations in turn force product, service, technologies and process logistics? Yes/No

Component 2 (Access to Financial Resources) under Financing

(Resistive) – Is access to financial resources based solely on correcting violations, such as those granted by regulatory agencies and reducing resource outlays associated with injury/illness and environmental incidents? Yes/No
– Are additional financial resources needed for providing technical day-to-day services provided only when it financially suits the company? Yes/No

(Adaptive) – Are ESH financial resources, strictly allocated to address compliance with regulations, specifically targeted within the organization's industry type? Yes/No
– Does access to financial resources needed to confront and manage more technically discriminating ESH issues depend upon the capabilities of ESH specialists to assemble internal coalitions of support in order to compete for funding? Yes/No
–Do ESH technical initiatives tend to have no clear criteria and pattern of funding, thus subjecting them to unpredictable funding outcomes? Yes/No

(Proactive) – Does Access to financial resources tend to be allocated when ESH budget requests are intended to improve compliance with regulatory standards, management of risk to resources, and reductions in outlays associated with accidents, environmental incidents, lawsuits, and boycotts? Yes/No
– Does the funding level tend to be at industry average levels and included into the overall budget of the core business units obtaining the services? Yes/No

(Sustainable) – Is access to financial resources and capital approved for 3 or more years (typically related to potential business contribution over the long and short term)? Yes/No
– Are distribution of financial resources based on factors and circumstances that are causing the organization to fail in its efforts to protect and use resources productively and/or conditions/circumstances under which ESH pays? Yes/No
– Do senior-level executives see investments in ESH strategy for the same reasons they make other investments; because they expect them

to deliver positive results and/or reduce contingent liability? Yes/No

Component 3 (Financial Tools) under Financing

(Resistive) – Do tools for performing financial and economic analysis of ESH practices not exist? Yes/No
– Is the organization aware of the potential risk and cost impact of failing to protect and use resources productively? Yes/No

(Adaptive) – Are financial tools for performing financial and economic analysis of environmental, safety, and health practices considered by senior-level executives to be qualitatively and quantitatively immaterial for business decision-making? Yes/No
– Do ESH cost accounting practices focus on aggregating cost data causing ESH costs to be hidden in general overhead accounts and are not included throughout the life cycle of the product, service, technology, or process responsible for their generation? Yes/No

(Proactive) – Are financial tools for performing financial and economic analysis of ESH practices chiefly focused on cost-benefit analysis? Yes/No
– Are costs accumulated either through the use of cost accounting systems or through the use of cost-finding techniques reported on a regular basis for management information purposes? Yes/No
– Are incident costs charged back to the core business unit where they occurred and incorporated into the budget making process? Yes/No
– Would you say that the function is ineffective in profiling the cost and profitability of ESH issues and integrating cost information into decision-making? Yes/No

(Sustainable) – Do tools for performing financial and economic analysis of ESH practices provide information to help stakeholders determine the efficiency and effectiveness of using resources productively and the cost of controls under different production scenarios? Yes/No
– Is ESH cost accounting/modeling a fundamental part of the organizations integrated financial management system and structured to place an economic value upon specific activities such as compliance, sustainable resource development, and due diligence reviews? Yes/No
– Do these tool provide reliable and timely information on the full cost burdens associated with the organizations products, services, technologies, and processes over their productive and economic life cycle? Yes/No

Appendix H Assessment Questions for Technical

(This is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe the manner in which your organization intends on creating and transferring technical knowledge used to confront and manage, environment, safety, health, and sustainable resource development issues?

(Resistive) – There is a minimal and reluctant effort extended with a tendency to respond to technical ESH issues only after the fact.

(Adaptive) – There is a reactive and narrow technical effort focused on the mechanics of complying with ESH regulations.

(Proactive) – There is a broad technical effort extended with a tendency toward accepting and internalizing ESH issues.

(Sustainable) – There is an extensive and forward-looking technical effort focused on the competitive value of ESH practices.

Each of the three components for the Strategic plan element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Technical Tools) under Technical

(Resistive) – Would you say that the organization's technical strategy could be characterized as permanently maintaining the present level of technical competencies and capabilities without effort for advancement? Yes/No

– Do no tools exist or are externally adapted to be used on ESH issues within the organization? Yes/No

(Adaptive) – Would you say that the organization's technical strategy could be characterized as being dependent upon technology changes applied to addressing regulatory compliance problems? Yes/No

– Are only those ESH tools {e.g., MSDS software, Job Safety Analysis (JSA)} that fulfill regulatory reporting requirements by state and federal administrations exercised at the organization? Yes/No

- Is the focus of this tool usage the periodic, intermittent, or general recognition and recording of ESH information for use in formal reports and process modifications? Yes/No
- Do tool utilization, maintenance, and subsequent decisions rarely leave the responsibility of the ESH specialists? Yes/No

(Proactive) – Would you say that the technical strategy at this level can be characterized as promoting technological change for production purposes (e.g., main business innovation)? Yes/No
- Has the organization has adopted a continuous and interval application of environmental and safety assessment tools {e.g., Detailed Hazard Analysis (DHA), Product Line Analysis (PLA), Environmental Site Assessment (ESA), HazOp Analysis} to manage quantities of natural resources used, wastes produced, hazard exposure, and contingent liability? Yes/No
- Is tool attention focused on current and future detection, interpretation, and modification of ESH impacts and risks associated with operations? Yes/No
- Are management decision-making processes dependent on these tools to provide the assessments that initiate strategic action within this function? Yes/No

(Sustainable) – Would you say that the technical strategy at this level can be characterized as routinely allocating resources to maintaining a technical knowledge foundation and developing core technologies and new tools for improving technical productivity? Yes/No
- Has the firm invested in an extensive compilation of ongoing ESH and economic tools {e.g., Life Cycle Analysis (LCA), Total Quality Assessment (TQA), Environmental Impact Assessment (EIA)} to investigate ESH, financial, and social effects of the organizational processes and their impact on organizational competitiveness? Yes/No
- Does tool attention focus on the comprehensive identification and modeling of: The risk, loss, and dangers that resources are subjected to, quality and financial effects from ESH issues, future liabilities, and organizational sustainability? Yes/No
- Does management rely on the strategic choice of tools, strongly related to organizational ESH objectives, to support research and technology decisions and serve as a baseline to improve ESH performance and sustainable development practices? Yes/No

Component 2 (Planning Processes and R&D) under Technical

(Resistive) – Are ESH technical considerations lacking in organizational planning processes and R&D? Yes/No

- Do the organization's technical functions tend to support short-term projects with little, if any, deliberation on ESH issues within the product or process? Yes/No
- Is the organization not aware of, chooses to ignore, or not interested in external developments in applicable technology and of how this could affect the ESH burden or opportunities inherently present in the operations? Yes/No

(Adaptive) – Are ESH technical considerations included in organizational planning processes and R&D on an ad hoc, or adaptive basis? Yes/No
- Are these considerations seldom a factor in determining if or which product is produced? Yes/No
- Are these considerations primarily formulated in reaction to current and imminent urgent problems, compliance with regulatory requirements, or in response to explicit requests from business customers? Yes/No
- Does the organization favor short-term solutions mainly through the adoption of end-of-pipe technologies as opposed to technological innovation? Yes/No

(Proactive) – Are ESH technical considerations included in organizational planning processes and R&D on an opportunistic basis? Yes/No
- Does the organization permanently monitor developments, changes, and trends in ESH technologies, but does not systematically and consistently incorporate it with planning? Yes/No
- Has the firm built a technical understanding and capacity for linking ESH innovation with improved organizational competitiveness? Yes/No
- Do the new innovative initiatives, distinguished from traditional add-on 'end-of-pipe' controls, encompass pollution prevention, toxic use reduction, and clean technology? Yes/No

(Sustainable) – Is the strategic consideration of ESH technical innovation fully embedded and linked within the project planning processes, R&D, and business operations? Yes/No
- Are ESH considerations seen in the overall broad organizational picture and improved technical efficacy is recognized as a strategically potent means for obtaining competitive advantage? Yes/No
- Are ESH R&D projects viewed as key investments to the future of the company that will address resource threats and opportunities? Yes/No
- Is the organization recognized as continually surpassing industry benchmarks and setting the standard of technological ESH innovation? Yes/No

Component 3 (Training) under Technical

(Resistive) – Does the organization not conduct any relevant training in the ESH technical area? Yes/No
– Does management assume and accept that employees will not provide potential value to the organization as they are denied technical training in ESH issues? Yes/No

(Adaptive) – Are the limited and basic technical training sessions focused on meeting regulations and ensuring current and future compliance? Yes/No
– Does specialized technical training on ESH issues for engineering, design, and R&D personnel not exist above that which is available to all employees? Yes/No
– Are additional attempts at ESH awareness in developing product processes, procedures, and tools not evident? Yes/No

(Proactive) – Is dedicated technical training conducted for all employees involved in product design, production processes, and resource utilization aspects? Yes/No
– Has management recognized that a proactive approach to enhancing compliance is a knowledgeable, environmentally aware work force? Yes/No
– Is the technical training conducted internally (mentoring, on-the-job training) and externally (consultants, conferences, meetings, professional journals) and focused on developing ESH awareness within the mindset and methodologies of the employees? Yes/No
– Are traditional job tasks expanded to include ESH concerns? Yes/No

(Sustainable) – Are strategically tailored technical training programs developed for all design, scientific, pre-production, production, and R&D functions to ensure a consistency with sustainable organizational development? Yes/No
– Has management found it financially and competitively advantageous to stay ahead of regulations and competitors and respond to current public attitudes toward ESH issues through technical development? Yes/No
– Does the technical training initiated by the organization occur regardless of the existence of regulatory requirements and meets or exceeds the industry average? Yes/No
– Is the majority of technical training programs carried out internally (mentoring, job rotation, workshops, communities of practice) and supplemented by external opportunities (universities, conferences, partnerships)? Yes/No

– Are trained employees accountable for viewing and considering ESH matters equally with other product/process concerns (costs, marketability) when performing all job tasks? Yes/No

Appendix I Assessment Questions for Evaluation

(This is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe the manner in which the organization intends to evaluate ESH performance and sustainable resource development practices?

(Resistive) – There is a minimal and reluctant effort to evaluate ESH.

(Adaptive) – There is a reactive and narrow evaluation effort focused on the guidelines of complying with ESH regulations.

(Proactive) – There is a broad technical and strategic management effort extended with a tendency toward evaluating all internal ESH issues.

(Sustainable) – There is an extensive and forward-looking strategic management and technical effort focused on evaluating all ESH issues that can influence the organization's competitive value.

Each of the three components for the Evaluation element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Process) under Evaluation

(Resistive) – Would you characterize the organization's performance evaluation as a nonexistent process? Yes/No
– Does the organization strongly believe that expenditures on ESH improvement represent costs that offer no corresponding benefits in terms of productivity, efficiency, liability reduction, public perception, and competitiveness? Yes/No

(Adaptive) – Can the organization's performance evaluation be characterized as a process to identify and monitor only those processes that affect the regulatory compliance stance of the organization? Yes/No
– Is there a lack of belief in empirical evidence or analysis that organizational ESH activities impact the business success of the firm (outside of the legal perspective)? Yes/No

– Are the driving forces influencing the organization's evaluation methods the increasingly stringent regulations regarding ESH impacts on its procedures, products, and production processes? Yes/No

(Proactive) – Can the organization's performance evaluation be characterized as a system intended to anticipate, identify, and monitor all activities and processes within the firm? Yes/No
– Have management attitudes evolved beyond a strict concern for compliance by realizing the potential of financial benefits from improved ESH performance? Yes/No
– Is the foremost driving force influencing the organization's evaluation techniques the commitment to ESH stewardship for managing risks to resources, minimizing accidents/incidents, and improving overall performance? Yes/No
– Is evaluation viewed as a tool to accurately assess and recognize performance levels and potential areas of improvement? Yes/No

(Sustainable) – Can the organization's performance evaluation be characterized as an all-inclusive process to assess ESH implementation and outcome measures in organizational procedures, activities, and all resource utilizations in order to ensure maximum efficiency? Yes/No
– Does the organization view ESH performance as a definitive area of competitive advantage and as a gauge of sustainability? Yes/No
– Is the purpose of the performance evaluation to change behavior that may increase profitability through sustainable development practices? Yes/No
– Has the organization realized that they can only effectively manage what they measure; therefore ESH evaluation has a permanent and highly integrated presence? Yes/No

Component 2 (Performance Tracking) under Evaluation

(Resistive) – Is ESH performance not tracked, or considered, in the operational evaluations of the organization? Yes/No
– Is there an inability to define relevant activities, an inability to quantify efforts and funds spent on ESH actions, and an undefined relationship between these activities and their operational impacts? Yes/No
– Are attempts to evaluate single elements of the organization's ESH burden initiated only in response to regulatory mandates and subject to change? Yes/No

(Adaptive) – Is ESH performance tracked through a set of indicators with a limited focus on failure rates and end-of-pipe controls for activities under regulatory control? Yes/No

- Are these measures limited to tracking costs, emissions, accidents, or other compliance related outputs and fail to adequately determine the efficiency or effectiveness of the underlying process? Yes/No
- Would you agree that this focuses strictly on the environmental burden on the organization and accidents/incidents involving human resources? Yes/No

(Proactive) – Is ESH performance tracked through numerous performance indicators throughout the areas of operational systems, management systems, and the environment? Yes/No
- Is major attention focused on choosing indicators that demonstrate continuous improvement, identify weak spots in the system, allow for more efficient distribution of resources, and provide a mechanism for assigning accountability for ESH risk, danger, and loss results? Yes/No
- Is a high priority placed on developing indicators for each organizational activity that reflect the goals, objectives, and targets? Yes/No
- Are the metrics, chosen for the broader indicator areas, recorded qualitatively and quantitatively, and accurately portray amounts, costs, time, efficacy, and contingent liabilities? Yes/No
- Does the organization investigate and implement, to the greate st degree practicable, metrics representative of current best practices in its industry for use in benchmarking? Yes/No

(Sustainable) – Is ESH performance tracked through a combination of fundamental environmental and more strategic indicators that detail where they are, where they were, and where the organization wants to be? Yes/No
- Is the choice of indicators driven by the organization's objectives, policies, goals, and the potential gain of competitive advantage with regard to significant success factors including profitability enhancement, regulatory positioning, market access, and stakeholder approval? Yes/No
- Is this is accomplished through the designation of applicable metrics within the indicator areas that are relevant to economic competitiveness (i.e., resource consumption, waste recovery, compliance costs, etc.)? Yes/No
- Are the metrics recorded qualitatively, quantitatively, absolutely, aggregated, and index/weighted for increased accountability, standardization, and comparability over time to produce trends that can be benchmarked against other companies or industries? Yes/No
- Are these metrics recorded on balanced scorecards to help management keep pace with the sustainability of the organization from both an environmental and financial standpoint? Yes/No

Component 3 (Assessment and Evaluation) under Evaluation

(Resistive) – Does assessment and evaluation of the environmental management system and its components not take place, as an already meager effort, structure, and activities comprise the ESH program? Yes/No

(Adaptive) – Is assessment and evaluation of the environmental management system and its components conducted through a limited set of self-audits focused on technical compliance with laws and regulations? Yes/No
- Is the audit process not intended to monitor indicators of daily compliance since direct responsibility rests on division managers, or their equivalent? Yes/No
- Are self-audits from these divisions regularly carried out and are basically reports stating 'yes; we are' or 'no; we are not' in compliance? Yes/No
- Is this system not geared to taking a holistic look at the organization's approach to ESH management or helping management devise better procedures to reduce ESH costs and impacts? Yes/No

(Proactive) – Is assessment and evaluation of the environmental management system and its components conducted through audits with an expanded scope beyond compliance to include risk assessments of unregulated activities? Yes/No
- Is the focus upon how the organization's ESH systems identify the business process points that impact resources, measure the potential for damage, mitigate the risks represented, and initiate control? Yes/No
- Are audits carried out according to risk-based factors, including the complexity of the facility/operation, intricacy of the regulatory environment, past compliance performance, continuity of the personnel involved, elapsed time since the most recent audit, and influences on the organization's financial standing? Yes/No
- Does this organizationally integrated audit series impact the business cycle of the firm? Yes/No

(Sustainable) – Is assessment of the environmental management system and its components conducted through a comprehensive variety of audits, differing in type and frequency, to monitor overall compliance and determine the efficiency and effectiveness of the organization's ability to protect and use resources productively? Yes/No
- Do these audits range from daily self-assessments to a detailed external audit? Yes/No
- Do the self-audits consist of equipment inspections, job procedure checklists, and other routine practices conducted on a daily basis? Yes/No

- Do internal audits ensure compliance with company objectives, industry initiatives, and governmental regulations, as well as reduce current ESH costs and future liabilities? Yes/No
- Do external audits provide senior management with independent verification and analysis of the competencies, capabilities, deficiencies of the ESH program, and confidence that all issues are being addressed? Yes/No
- Does this enhanced, all-inclusive auditing process result in a more proficiently integrated ESH program that reduces liability, prevents losses, reduces costs, fosters profits, and leads to increased sustainability of the organization? Yes/No

Appendix J Assessment Questions for Information Management

(This is the initial question that will determine which developmental level of questions to begin asking.)

How would you describe the manner in which the organization provides information to internal and external parties (customers, stakeholders) on ESH strategy control, progress, and sustainable resource development?

(Resistive) – There is a minimal and reluctant effort to provide relevant ESH information to external and internal parties.

(Adaptive) – There is a reactive and narrow effort focused on providing ESH information only when a regulatory compliance issue arises.

(Proactive) – There is a broad effort extended with a tendency toward providing comprehensive internal access, and limited external access, to ESH information.

(Sustainable) – There is an extensive and forward-looking information management effort focused on the competitive value of providing access to ESH information internally and externally.

Each of the three components for the Strategic plan element has been separated and broken down by the different strategies available. The organization will be asked the level of questions corresponding to how they answered the initial question above. 'Yes' answers indicate that they do indeed follow that strategic level. Receipt of 'No' answers may require that the questioner jump up or down a level.

Component 1 (Information Compilation) under Information Mgmt.

(Resistive) – Can the information management strategy at this level be characterized as an incomplete, unorganized, or fragmentary compilation of information pertaining to ESH issues within the organization? Yes/No
– Have a history of insufficient data generation and recording activities lead to a piecemeal collection of information? Yes/No
– Is important ESH information often gathered and compiled only by necessity after receipt of fines and mandates by regulatory agencies?

(Adaptive) – Can the information management strategy at this level be characterized as a fragmented approach that centers on targeted areas within the organization? Yes/No

– Is the focus upon those processes and activities that dictate the regulatory and legal standing of the organization? Yes/No

(Proactive) – Can the information management strategy at this level be characterized as an integrated approach that concentrates upon information from areas within the organization experiencing risk, danger, and loss? Yes/No
– Does the organization believe that information from these areas has the same worth as operational information from different department and can equally affect the competitiveness and profitability of the firm? Yes/No
– Is the focus of the organization's ESH knowledge management the early recognition and rectification of existing and future issues while keeping in mind how it contributes to the performance of the firm? Yes/No
– Are information management efforts (collection, processing) concentrated towards the areas deemed to hold the majority of the organization's ESH burden? Yes/No

(Sustainable) – Can the information management strategy at this level be characterized as a holistic approach that balances and incorporates all relevant human, operational, organizational, and technological components of the organization? Yes/No
– Is the focus of the firm's ESH knowledge management to create economic value, which leads to increased organizational sustainability? Yes/No
– Does the organization place a high emphasis on applying knowledge management (collection, processing, reporting) to higher risk business processes whose improvement will create a significant return on investment? Yes/No

Component 2 (Access) under Information Management

(Resistive) – Is organizational access to ESH information internally confined to the point of origin of the data? Yes/No
– Is the information available not present beyond the actual process, department, or area in which it was generated? Yes/No
– Does communication of ESH strategy, control, and progress not take place unless initiated in response to regulatory mandates and involves as few people/resources as possible? Yes/No
– Are additional information transfers of performance, issues, and concerns of the firm in this area informal, unplanned, and not expected of the organization as a whole? Yes/No

(Adaptive) – Is organizational access to ESH information internally available as a limited number of hard-copy graphs, spreadsheets, figures, and tables? Yes/No

- Does the extent of the information encompass only a limited number of regulated processes over specified time periods? Yes/No
- Is communication of ESH strategy, control, and progress the responsibility of a core group of ESH specialists located in central operational areas encountering regulatory compliance concerns? Yes/No
- Does each individual overseeing the information collection of a specific operation, and subsequent reporting, work independently of similar employees in different areas? Yes/No

(Proactive) – Is organizational access to ESH information internally provided through hard-copy documents from spreadsheet and text applications, databases, and the intranet/internet as a supplement? Yes/No
- Is ESH information recorded and available from all performance entities (division, processes, etc.) and is displayed using a standardized format? Yes/No
- Is communication of ESH strategy, control, and progress transmitted through lines of responsibility and accountability established throughout designated functions? Yes/No
- Is there a utilization of specialized software programs typically involving tools for complying with ESH laws and regulation (Health and Safety software, Environmental Cost Assessment software)? Yes/No
- Are increasingly upper-level and senior level management involved in the meetings and communication pathways, but this is not a permanent arrangement? Yes/No

(Sustainable) – Is organizational access to ESH information internally composed of a combination of software applications, databases, and on-line sites that can be accessed from computer terminals throughout the organization? Yes/No
- Is information processed and stored by employees with direct/indirect accountability and influence on particular activities? Yes/No
- Are various software programs that go beyond compliance utilized to identify areas for improvement and speed the consolidation of relevant ESH information into reports based on a specific product, location, process, division, or time period? Yes/No
- Are these reports made internally available primarily through intranets and the internet? Yes/No
- Is communication of ESH strategy, control, and progress conducted through regular and frequent meetings between a cross-section of employees at different levels and divisions of the organization? Yes/No
- Due to the awareness of how ESH performance and regulations affect the business decisions of the organization, are senior level executives a permanent and necessary fixture at the meetings? Yes/No

Component 3 (External Reporting) under Information Management

(Resistive) – Does reporting to the external environment not take place because the organization does not want to, does not believe it needs to, or sees no potential benefit in disclosing the ESH performance level and status of its operations? Yes/No

(Adaptive) – Does reporting to the external environment take the form of annual organizational ESH reports relating to the firm's level of regulatory compliance? Yes/No
– Are these hard-copy reports limited in ESH information and are publicly available only upon request? Yes/No

(Proactive) – Is reporting to the external environment a repeated voluntary initiative stemming from the pressures of various groups that have a direct interest in the ESH performance of the organization? Yes/No
– Does the organization have a desire to demonstrate a responsible and proactive attitude toward ESH issues in view of awareness from shareholders, banks, local communities, corporate customers, employees, and business analysts? Yes/No
– Are reports published and available on-line concurrently with the financial reporting of the organization and communicate ESH commitment, targets, and performance? Yes/No

(Sustainable) – Is reporting to the external environment given an equal priority as the internal information system flow? Yes/No
– To maintain a favorable reputation and enhance the attractiveness of the organization, is public dissemination of ESH strategy, control, and progress provided? Yes/No
– Is this accomplished through publishing and providing on-line, specific ESH targets, identification of the lines of ESH responsibility, program successes, limitations, and quantitative performance data? Yes/No
– Are performance improvements to the organization's ESH activities also made public through targeted environmental communications to all stakeholders and the financial community? Yes/No

Appendix K Peer Reviewer Information

1. Team Leader – Management Systems
   Safety, Health, and Environmental Management Division
   Role in position: Heads up Government Effort on ESH.

2. Environmental, Safety, and Health Director
   Role in position: Formulates ESH strategy at a major research based hospital.

3. Managing Consultant
   Role in position: Formulates and directs a regional loss control effort.

4. Professor
   Department of Kinesiology and Health Science
   Role in position: Research in Financial and Technical aspects of ESH

5. Director
   Safety, Health, and Environmental Management Division
   Role in position: Directs and evaluates ESH function within the government.

6. Professor
   Department of Environmental Health Sciences, Safety, & Technology
   Role in position: Researches strategy and structure at a major east coast university.